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SURGERY AND THE BASIC SCIENCES

THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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THYROID AND PARATHYROIDS

OUR knowledge of the processes of secretion and colloid absorption by the thyroid follicles has been obtained by histological examination of dead thyroid tissue representing static conditions of the gland. Since under these circumstances the individual follicles are in various stages of activity, it has been difficult to determine the states of the secretory cycle and to observe the details of the process of formation and resorption of colloid. Williams (1) has applied a new technique in observing the living tissue which promises to reveal important information concerning the activities of this gland. In rabbits Williams has transplanted minute pieces of thyroid tissue into the ear, in which a transparent chamber has been constructed. By this method the behavior and cyclic changes of the follicles can be examined continuously under the microscope for hours and days, so as to provide a continuous picture of the sequence of events. Williams has detected a cycle of activity consisting of four recognizable stages, the stages of secretion, of secretion and colloid release, of partial collapse, and of recuperation. In the stage of secretion the follicle wall thickens and colloid begins to accumulate. In the stage of secretion and colloid release, the follicle wall becomes thinner, the amount of colloid increases rapidly, and irregularities appear in the outline of the follicular lumen. These irregularities and indentations indicate the release of colloid, for continuous

observation reveals that by a process of invagination the follicular wall surrounds and pinches off a small portion of colloid, which gradually disappears while still within the follicular wall. In the stage of partial collapse the release of colloid by this process occurs more rapidly than the formation of new colloid with the result that the follicle begins to collapse. In the stage of recuperation, during which very little colloid is present, the walls thicken and the follicle prepares itself for another cycle of activity. A cycle may be completed in a period varying from several hours to several days. The evidence obtained by this method indicates that secretion is always toward the lumen of the follicle. This process is revealed by the occasional appearance adjacent to the secreting cells of transient vacuoles. Release of the colloid for distribution to the body is accomplished by the activity of the follicular wall as described above. Williams also studied the behavior of the transplanted thyroid tissue while under the influence of a stimulus provided by injections of the thyrotropic hormone of the pituitary gland. The action of this hormone was characterized by an increase in the colloid content in certain follicles, and a marked increase in the rate and extent of colloid release in most of the follicles.

It would be of interest to observe the follicles with this technique when iodine is given in conjunction with the thyrotropic hormone, for the mechanism by which iodine antagonizes the action of this hormone is little understood. Anderson and Evans (2) have recently reported that in guinea

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explanation for these contradictory reports Zondek and Sulman (7) have studied quantitatively the properties and behavior of a purified antigonadotropic factor obtained from serum. They found the anti-hormone to be specific against the species and not the gonadotropic factor, and point out that crude qualitative tests employing excessive amounts of anti-serum will obscure this species specificity. Furthermore, Katzman, Wade, and Doisy (8) reported that chronic implants of rat pituitary glands into rats did not lead to the development of a refractory state even after nine months. They have since reported identical results with the use of extracts of rat pituitary glands for prolonged administration to rats (9). They explain the contrary findings of Selye, Collip and Thompson (10) on the basis that chemical alteration of the latter's extracts in the course of preparation rendered them foreign to the body and therefore capable of behaving as antigens. Perhaps the most conclusive results yet reported are those of Werner (11). This investigator compared the effect of a relatively crude and of a relatively pure preparation of the thyrotropic hormone. Guinea pigs almost uniformly became refractory to the crude preparation, but only rarely

to the pure material. Furthermore the animals which had become refractory to the crude material, responded perfectly well to the pure preparation. The most significant finding was that the animals could be rendered refractory by the administration of the crude extract in doses which were too small to produce any hormone effect. It is inconceivable that the body should supply large amounts of anti-hormone in response to sub-threshold doses of the hormone! (If it were true, then all women would become sterile after puberty, because they would become refractory to the increased amounts of pituitary gonadotropic hormone elaborated at this time.) It is well-known, however, that only minute amounts of antigen are required to stimulate the formation of anti-bodies. It appears at present that the question of refractoriness is one of immune reactions rather than of physiological hormone antagonists. Obviously the only problem, if indeed there be any problem at all, is that of determining whether or not animals will become refractory to pure, crystalline hormones. As a matter of fact, it is now known that animals do not become refractory to crystalline theelin, thyroxin, and insulin.

DIABETES MELLITUS

For many years a spirited controversy has been in progress between the exponents of the "non-utilization" and "overproduction" theories of diabetes mellitus. The "non-utilization" theory maintains that diabetes is due primarily to the inability of the tissues to oxidize sugar. On the other hand, the "overproduction" theory maintains that diabetes is due primarily to excessive gluconeogenesis (formation of sugar from non-carbohydrate sources) by the liver. The "non-utilization" theory has been unable to explain the fact that the depancreatized dog definitely oxidizes sugar as revealed by the rapid disappearance of blood sugar after hepatectomy (Mann and Magath, 12). On the other hand, the "overproduction" theory has been unable to explain the fact that the excised tissues from depancreatized animals do not oxidize sugar at the normal rate (Richardson, Shorr, and Loebel, 13). Soskin and Levine (14) have published a report in which they claim to have reconciled the two theories and to have explained the apparently contradictory facts mentioned above. They determined the rate of glucose oxidation in normal and depancreatized dogs after evisceration. They found that the rate of glucose oxidation varied with the blood-sugar level. Although at any given glycemic level the

depancreatized dog oxidized less sugar than the normal dog, at the diabetic blood-sugar level the depancreatized dog oxidized sugar at the same rate as the normal dog with a normal blood-sugar level. They concluded from their work that the diabetic animal oxidizes sugar at the normal rate, but in order to do so it must maintain a hyperglycemia by excessive gluconeogenesis in the liver. If these results are confirmed, they will aid materially in reconciling the various facts and theories regarding diabetes mellitus.

If it is true that sugar is being oxidized in diabetes, the question arises as to why the disease should be accompanied by ketosis. According to the classical theory, ketone bodies accumulate only as a result of non-oxidation of sugar. Evidence has been obtained which indicates that the rate of formation of ketone bodies may be of more practical importance than the rate of oxidation in the production of ketosis. Ten years ago Chaikoff and Soskin (15) showed that the eviscerated depancreatized dog can oxidize large amounts of injected aceto-acetic acid, and that the main site of acetone-body formation is the liver. In 1931 Himwich, Goldfarb, and Weller (16) determined the hepatic portal-hepatic vein differences in blood acetone bodies in diabetic dogs, and cal-

pigs iodine in the proper dosage abolished the calorigenic action of the thyrotropic hormone. However, the gland increased in weight and assumed the appearance of hyperplasia to the same extent as that in the controls receiving only the thyrotropic hormone. This is in contrast to the findings of Cattell (3) in man that the administration of iodine diminished the hyperplasia and promoted storage of colloid. There is ample evidence that iodine acts directly on the thyroid gland since it does not antagonize the action of thyroxin in the tissues. On the basis of Williams' observations on the living thyroid, the effects in man would indicate an interference with the release of colloid, whereas the effects in guinea pigs would indicate an interference with secretion. Yet, it is known that iodine may at times decrease the size of a colloid goiter. Study of the living follicles would be required to explain the apparently diverse actions of iodine on the thyroid gland.

Although acute hyperthyroidism has received sufficient attention and study both clinically and experimentally, so that its dangers are well appreciated, comparatively little is known of the possible dangers accompanying chronic low grade hypersecretion of the thyroid. Connor (4) has observed death from heart failure in several cases of long standing, but low grade hyperthyroidism without other significant findings. In order to study this condition further, he administered small doses of thyroid substance daily for ten months to rabbits. All of the animals developed enlarged hearts with focal myocardial necrosis. One of the animals died of myocardial failure. He noted also degeneration of the eye muscles and atrophy of the gonads and reproductive tract. This work emphasizes the dangers which may be encountered in chronic low grade hyperthyroidism.

It is well known that excessive doses of parathyroid extract exhibit a marked toxic action which may easily terminate fatally. The symptoms of overdosage have been generally attributed to renal damage, since there is usually an anuria and nitrogen retention. For these symptoms there has been no effective remedy. However, recent work by Shelling Kaye and Guth (5) indicates that the disturbance of the renal function is purely secondary and can be prevented by simple therapeutic measures. These investigators administered repeated moderately large doses of parathyroid extract to dogs and observed a severe diuresis which was later followed by an oliguria and anuria. The profuse diuresis resulted in serious loss of water, sodium chloride, calcium, and phosphorus from the body. These authors were able to overcome these ill effects of the overdosage by administering salt solution in amounts sufficient to replace the fluid and electrolytes lost in the urine. Under this treatment oliguria and azotemia did not occur and the animals not only survived the experience but showed little effects from the overdosage with the extract. If the volume of saline administered was not sufficient to prevent the loss of body fluid and electrolytes, no beneficial results were observed. Furthermore, although the administration of glucose solutions prevented dehydration and maintained the urine flow, it accentuated the mineral loss and was accordingly of less benefit than saline solution. This work perhaps offers an explanation for the fact that patients with a constant high blood calcium from hyperparathyroidism do not show toxic symptoms since an unrestricted diet may prevent fluid and mineral loss. The findings also suggest a simple and readily available method for combating the effects of overdosage with parathyroid extract.

ANTI HORMONES

It is now well established that animals may become refractory to certain crude hormone preparations particularly those of hypophyseal origin after prolonged administration. It has been shown that the serum from such refractory animals will passively immunize other animals to the original extract. On the basis of these findings, Collip (6) formulated his theory of anti hormones. This theory supposes that there is normally a balance in the body between hormones and their antagonists or anti hormones. The injection of a hormone upsets this balance and the organism responds by the production of its normal physiological antagonist. Since the theory was proposed

a flood of material has appeared both in support and in denial of the theory. Those who deny the truth of the theory explain the development of refractoriness on the basis of immune bodies produced against the protein impurities of the crude extracts. The evidence supporting this view consists of numerous reports to the effect that the refractory state is specific for the animal species from which the extract is made and not specific for the hormone contained in the extract. However, this series of reports is counterbalanced by a series in which it is maintained that the refractory state is specific for the hormone and not the species of origin. Recent work provides a possible

patients were diabetic because of an increased secretion of this factor by the pituitary gland. On the basis of this theory he explains the observations of others, that certain diabetic patients easily tolerate a high carbohydrate diet (pan-

creatic hypofunction), whereas others do not (pituitary hyperfunction). If future investigation supports this work, it will be of immense practical importance in the understanding and management of the diabetic patient.

VITAMIN B COMPLEX

In past years so many essential dietary factors required by a large variety of animal species have been reported to be present in yeast that the situation has become almost unintelligible to even those who are familiar with this field of investigation. Fortunately the era of confusion is giving way to the era of clarification, for one by one the active substances are being isolated and identified. The first of these to be isolated and identified was the anti-neuritic vitamin now known generally as thiamine. The second was the factor required for growth and prevention of cataract in the rat, previously called B₂ or G, and now known as riboflavin. It is responsible for no known deficiency disease in man, but its fundamental rôle in tissue respiration probably means that it is an essential factor in the human species. It now appears as if a third factor, the pellagra-preventive factor of Goldberger, has recently been isolated and identified as nicotinic acid. A fourth factor, which has been variously designated as B₆, H, factor I, and factor Y, is required by the rat. Its deficiency produces cutaneous symptoms called florid dermatitis, rat dermatitis, a specific type of skin lesion, or acrodynia. Lepkovsky (29) and Keresztesy and Stevens (30) have very recently reported the isolation of this factor in crystalline form. Among the factors remaining to be cleared up are vitamin B₃, necessary for growth in the pigeon, B₄, necessary for the prevention of a specific paralysis in rats and chicks, and B₅, reported to be necessary for weight maintenance in pigeons (for a recent review see Nelson, 31). As each factor is isolated and identified, the problem of investigating the remainder is simplified, so that clarification may be expected in the near future, provided of course that the situation does not parallel that of the swordsman and the Hydra's heads.

Nicotinic acid was reported by Frost and Elvehjem (32) to promote growth in rats on a deficient diet. In a preliminary communication (33) followed by a complete report (34), Elvehjem, Madden, Strong, and Wooley announced the isolation of nicotinic acid from extracts which were effective in preventing black tongue in dogs maintained on a pellagra-producing diet. Nicotinic acid was remarkably effective in curing and preventing this canine deficiency disease. This latter

fact was quickly confirmed by Street and Cowgill (35). Since pellagra in man and black tongue in dogs have been shown to be closely related, the effects of nicotinic acid were soon tested in pellagrins, with striking success as reported by Smith, Ruffin, and Smith (36), Fouts, Helmer, Lepkovsky, and Jukes (37), and Spies, Cooper, and Blankenhorn (38). The latter workers reported that nicotinic acid failed to cure the peripheral neuritis which may accompany pellagra, but Spies and Aring (39) showed that this symptom was rapidly cleared up by the administration of thiamine (B₁). Nicotinic acid has been reported by Spies, Gross, and Sasaki (40) to decrease the porphyrinuria found in pellagra, as well as that found in lead poisoning (Gross, Sasaki, and Spies, 41). In view of the necessity for information on the toxicity of nicotinic acid, Chen, Rose, and Robbins (42) have reported its effects in mice, rats, and guinea pigs. Unlike its complex derivative, nicotine, they found it to have no ganglionic action, and its toxicity was observed to be less than one hundredth of that of nicotine. They noted, however, that 2 gm orally per day resulted in severe poisoning and death in dogs. This is at least 100 times the therapeutic dose for a dog.

Although black tongue in dogs and chick dermatitis are closely related to human pellagra, no analogous condition has been produced in rats. Gyorgy, Goldblatt, Miller, and Fulton (43) have recently discovered that rats maintained on a vitamin B₆ deficient diet could be cured of their acrodynia by the administration of purified extracts of vitamin B₆, only to succumb to the entirely new rat deficiency disease of panmyelophthisis. In experiments designed to show that acrodynia was not cured by nicotinic acid, Gyorgy (44) discovered that the nicotinic acid cured and prevented the appearance of panmyelophthisis. This constituted the first demonstration of the requirement of the rat for the pellagra-preventive factor. The condition of panmyelophthisis in the rat is characterized by severe anemia, thrombocytopenia, and leucopenia. The granulocytes may disappear from the blood. The disease is accompanied by epistaxis, melena, hematuria, and purpura. Examination of the bone marrow revealed an almost complete arrest of hemopoiesis, with

culated that in ketosis many times more acetone bodies were being oxidized by the tissues than were being eliminated by the kidneys and lungs. Greenberg (17) was able to diminish the ketonuria in diabetic rats (phlorizinized) by the administration of hydrazine, a compound which produces a specific liver damage. This decrease in ketonuria was not accompanied by an increased oxidation of sugar. This evidence emphasized the fact that even in ketosis the tissues oxidize large quantities of ketone bodies, and that the appearance of the latter in the blood and urine may be due to a too rapid formation in the liver. Murlin, Nasset, Murlin, and Manly (18) working with human subjects obtained evidence that the degree of ketosis was independent of the amount of sugar oxidized. They concluded that the well known ketolytic action of sugars should be attributed to an inhibition of ketogenesis in the liver as a result of glycogen deposition rather than to a stimulation of ketone oxidation. Mirsky, Heiman, and Broh Kahn (19) reported that the intravenous administration of large quantities of glucose exerted a ketolytic action in depancreatized dogs in which insulin is completely lacking. Barker (20) found that increased fat metabolism produced by thyroxin or dinitrophenol did not increase ketonuria, a fact which Mirsky and Broh Kahn (21) explained on the basis of their observation that these drugs greatly increased the rate of oxidation of injected ketone bodies. The newer evidence therefore indicates that the ketone body level of the blood is the resultant of the rate of formation and the rate of oxidation of ketone bodies. As a factor in the production of ketosis the rate of formation is now being emphasized, where previously the rate of oxidation was considered the sole factor. As a result, Schaeffer's ketogenic anti ketogenic ratio for the formulation of diets is deprived of its original theoretical support but nevertheless it remains as useful empirically today as it has in the past.

Since the classical work of Houssay which demonstrated that hypophysectomy ameliorates experimental pancreatic diabetes, the possibility that diabetes mellitus might result from hyperfunction of the pituitary gland as well as from hypofunction of the pancreatic islets has been considered. Attempts to obtain a diabetogenic principle from the anterior lobe of the hypophysis have been partially successful. The diabetogenic principle apparently consists of at least two separate hormones: one concerned with carbohydrate metabolism the other with fat metabolism. The latter is usually called the ketogenic hormone because of its property of produc-

ing a ketosis. In addition to this property, it increases liver glycogen without however, exerting any appreciable effect on the blood sugar level (for a review on this subject see Collip, 22). Young (23) has obtained a pituitary extract which without causing glycogenolysis, renders liver glycogen more labile to the action of adrenalin and counteracts the hypoglycemic action of insulin. This substance, which has been named the glycotropic factor is separate from the gonadotropic, thyrotropic, and lactogenic principles of the pituitary gland (Young, 24). Young (25) has also reported that the injection of large amounts of extracts of the anterior lobe of the pituitary gland will produce diabetes mellitus in dogs which persists after withdrawal of the extract and is believed to be permanent. Previous attempts to produce this condition have yielded only a very transitory glycosuria, because of inadequate dosage. Young's animals have shown a severe glycosuria which required as much as 60 units of insulin per day for control yet the animals survived for long periods without insulin.

Himsworth and Scott (26) report that rabbits maintained on a low carbohydrate diet showed an impaired sugar tolerance and an insensitivity toward insulin. This response to the low carbohydrate diet was abolished by hypophysectomy, but could be restored by the administration of Young's glycotropic factor of the pituitary gland. They concluded that the hypophysis elaborates the glycotropic factor in response to a low carbohydrate diet. Further study of the action of the extract (Himsworth and Scott, 27) showed that it inhibited the effect of insulin in hastening the disappearance of sugar from the blood in hepatectomized animals. This work revealed that the glycotropic factor counteracted insulin, not only by promoting rapid glycogenolysis in the liver but also by inhibiting the utilization of glucose by the peripheral tissues. Himsworth has correlated these results with his clinical observations (28) to the effect that there are two distinguishable types of diabetes mellitus. On the basis of an improved method for measuring the sensitivity of diabetic patients toward insulin he was able to classify them as insulin sensitive and insulin insensitive individuals. The insulin sensitive patients he believes suffer a deficiency in pancreatic function; they respond to a high carbohydrate diet with an improved sugar tolerance just as his rabbits did. The insulin insensitive group, on the other hand failed to develop a tolerance to a high carbohydrate diet and in this respect resembled the rabbits receiving the glycotropic factor of the pituitary gland. Himsworth therefore believes that these

In a recent article Jones (61) presents evidence favoring his view that the macrocytes of pernicious anemia are not red cells of the normal series in an arrested stage of development, but represent the mature stage of a pathologically developing red-cell series. He claims to be able to distinguish normal megaloblasts from the pathological megaloblasts in the bone marrow of patients with pernicious anemia. After institution of liver therapy the abnormal cells are purged from the marrow and appear as large reticulocytes. In the marrow

their place is then occupied by cells developing normally. On the basis of these findings he interprets Wintrobe's (62) findings, that the mean corpuscular volume increases during liver therapy, as the result of an outpouring of reticulated macrocytes. The more severe the anemia, the fewer the normal cells in the bone marrow, and this accounts for the fact that the normal reticulocyte response which follows after liver therapy is inversely proportional to the severity of the disease.

THE SURGICAL REPAIR OF DIRECT INGUINAL HERNIA

The surgical repair of direct inguinal hernia has never been a completely satisfactory procedure, as follow-up studies have revealed a recurrence of hernia in approximately 25 per cent of the cases. Recent anatomical investigation of inguinal relations by Anson and McVay (63) have disclosed the anatomical defect which gives rise to direct hernia. This information has been applied by Zimmerman (64) to the improvement of the surgical technique of herniorrhaphy. It was found in a significant number of cadavers that the lower border of the internal oblique muscle ended at a variable distance above the pubis, and left a triangular area in which the floor of the inguinal canal was unsupported by overlying muscle.

Zimmerman's clinical observations supported the conclusion that the underlying predisposing anatomical basis for direct hernia consists of this congenital absence of adequate muscular support for the lower portion of the inguinal canal. The correct surgical repair of this condition should be a reinforcement of the weakened area. Zimmerman accomplishes this by suturing a flap of the aponeurosis of the external oblique muscle over the lower portion of the floor of the inguinal canal. In a series of 59 cases in which this improved technique was used, and which have been followed for a minimum period of one year postoperatively, the incidence of recurrence has been only 10 per cent.

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absence of megakaryocytes and granulocytes. The disease resembled aleukia hemorrhagica as found in man. This condition in rats resembles somewhat a milder condition produced in dogs on a black tongue diet (Miller and Rhodes, 45), and in monkeys on a B complex deficient diet (Day, Langston, and Shukers, 46).

If nicotinic acid is essential for hemopoiesis in rats, it is difficult to imagine that it plays no similar rôle in man, hence the question arises as to why pellagrins do not show symptoms of this deficiency. It may be true of man as Gyorgy be-

lieves is true of rats, that one deficiency may mask or prevent the development of another. That pellagra may be more than a simple deficiency is evident from neuritis attributable to thiamine deficiency. On the other hand, a deficiency of nicotinic acid may render the animal susceptible to a toxic agent for bone marrow, such as indole and amidopyrine in dogs on a black tongue diet (Miller and Rhodes, 47, and Rhodes, 48). However, the similarity of these conditions in animals to aleukia hemorrhagica and agranulocytosis makes their study of practical importance.

PORPHYRIN METABOLISM AND PERNICIOUS ANEMIA

Considerable interest has been aroused in the study of the metabolism of porphyrins in health and disease. Fischer (49) has studied the various porphyrins chemically and has synthesized four basic types, only two of which, however, appear to be concerned in animal economy. The molecules are of such structure that it is doubtful whether the body can convert one into the other without almost complete destruction and resynthesis. Porphyrins of the basic Type III are a constituent of the respiratory pigments hemoglobin and myoglobin. The Type I porphyrins are not known to be constituents of any functional elements of the body but are nevertheless excreted constantly, mainly in the form of coproporphyrin I. In congenital porphyria with the characteristic photosensitivity, large amounts of Type I are excreted according to Dobriner, Localio, and Strain (50). Beckh, Walter, Ellinger, Phillip, and Spies (51) have found large quantities of porphyrins in the urine of pellagrins. It is interesting in this connection that exposure to sunlight in susceptible patients on a pellagra-producing diet will precipitate the acute symptoms of the disease (Smith and Ruffin, 60). As previously mentioned the administration of nicotinic acid will correct the porphyrin excretion in pellagra. An increase in the excretion of Type I porphyrins has been demonstrated in hemolytic jaundice (Watson, 52; Dobriner, Strain, Localio, Keutmann, and Stephens, 53) in certain diseases of the liver (Dobriner, 54; Watson, 55), and in pernicious anemia (Dobriner and Rhoads, 56; Watson, 57). An increased elimination of porphyrin III has been demonstrated in lead poisoning (Watson, 52; Dobriner, 54) and hemosiderosis (Dobriner, 58). In the case of lead poisoning Gross, Sasaki, and Spies (41) have found that nicotinic acid reduces the porphyria.

There is no unanimity of opinion at the present time as to the significance which should be at-

tached to the excretion of these pigments, particularly in the case of coproporphyrin I, which fulfills no known function in the body. Dobriner and Rhoads (56) believe that Type I is a by-product of the synthesis of Type III in the process of hemoglobin manufacture, and its excretion is therefore an index to the rate of hemoglobin formation. This view is based on their observations that in hemolytic jaundice and in the treatment of polycythemia by phenylhydrazine, both of which conditions are accompanied by increased erythropoiesis there is an increase in excretion of Type I porphyrins. In order to eliminate completely the complicating factor of hemolysis which on theoretical chemical grounds they believe, can not give rise to Type I porphyrins, they have shown that dogs which are replacing hemoglobin after hemorrhage excrete excess amounts of Type I (59). Excretion of Type II, on the other hand, would represent rapid hemolysis or an inability of the body to open the ring structure in the process of conversion to bilirubin. On the basis of this theory, these authors contend that the increased excretion of Type I porphyrins in pernicious anemia signifies an increased hemoglobin production. They do not believe therefore, that pernicious anemia is characterized by an arrested development of the red cells, but rather by a more rapid formation of cells in response to excessive hemolysis. This increased elimination of porphyrin in pernicious anemia is restored to normal by specific liver therapy. It would be interesting to know whether liver is effective in this regard because of the anti-pernicious anemia principle or because of its content of nicotinic acid. As mentioned previously the absence of nicotinic acid renders animals quite susceptible to the hemolytic action of indole. There is a curious set of relationships between these various factors and diseases that would apparently repay further investigation.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Otto, W.: *Experience Gained in Germany and Austria during the World War in Injuries to the Jaw* (Die Erfahrungen, welche der Weltkrieg auf dem Gebiete der Kieferverletzungen in Deutschland und Oesterreich brachte) Freiburg Dissertation, 1937

This is a paper worthy of the study of every surgeon. The frequency of injury to the jaw is attested by a French report of 1915 which shows that of 92,950 head injuries, 60 per cent were gunshot wounds of the jaw. In general, the injuries of the upper jaw are the most favorable to treatment. In this region puncture wounds are the most common, and even if splintering has occurred the fragments are apt to remain in apposition. Of special interest to the surgeon, is that the otherwise infallible rule of early, from six to eight hours, excision of the wound with primary suture does not apply for this area. The majority of these primary sutures did not hold, or, and this was important, were a hindrance to the subsequent repair of the dentist. Should sutures be required, neither silk nor catgut should be employed but very fine wire, for infection travels readily down the tract of the suture. In general, suture is contra-indicated except for a few retention sutures, placed so as not to hinder the work of the dentist. In most instances open wound care should be used with the necessary tamponade. Even Panzer, who recommends suture, does not make it for at least from ten to twenty days after the injury and subsequent splinting. Bone suture does not even come into consideration, as the results are invariably poor. The care of the fracture should be in the hands of the dentist. Routine treatment cannot be exercised. Fever, suppuration, and splintering do not contra-indicate splinting. The Schroeder emergency bandage, a wire arch with bands and a sliding splint, has shown itself useful, as it can be used without a primary moulage. If the fracture is outside of the tooth area, the inclined plane with intermaxillary rubber traction is made use of. In the fractures with marked displacement the intra-extra-oral splint with extension must be used. In the neglected cases and those in which reduction cannot be obtained by the afore-mentioned methods, open reduction must be employed. Pseudarthroses should be treated by the use of bone transplants derived from the tibia, or, still better, from the ileum, and for replacement of the ascending mandibular ramus, tarsal bones may be employed. However, these procedures can be carried out only after healing without fistulas is complete. In general, the regeneration possibilities of the mandible are

great when there are no real defects, but the treatment requires a great deal of time.

Where should the care of these jaw injuries be carried out? The author, speaking from the experience of the World War, believes that only a slight amount of care can be given the patient in the field hospital, or even in the base hospital. The patient should be sent to his home hospital as soon as possible, or to special hospitals organized for this special work. Only extremely mild cases can be handled in an ambulatory fashion.

(FRANZ) WILLIAM C BECK, M D

EAR

Davis, J. S., and Kitlowski, E. A.: *Abnormal Prominence of the Ears: A Method of Readjustment*, *Surgery*, 1937, 2: 835

The authors state that the use of the brain table in allowing exposure and comparison of both ears at the same time in the desired position is advantageous. The object of the procedure is to reconstruct the undeveloped or unfolded portion of the anthelix so that a rigid buttressing ridge, or ridges, will be formed which will support the ear in its normal position.

A distinct advance in technique consists in perforation of the tissues with the needle dipped in brilliant green solution and marking of the line of cartilage to be incised or excised. The importance of completely breaking the cartilage spring by incision or excision is emphasized, as the authors have never seen a permanent result unless the spring of the cartilage was broken.

In the method described, the sutures used in turning forward the cartilage edges to form the anthelix are all placed in the perichondrium, as the cartilage itself is friable, and none is placed in the periosteum of the skull.

The use of the seasponge as a postoperative dressing has been very helpful in fixing the reconstructed ridges and in immobilizing the entire ear.

After successful restoration of prominent ears to normal position, the appearance of the patient is vastly improved, the mental aspect is greatly changed for the better, and many adults are able to obtain suitable employment from which they had been barred on account of their bizarre appearance.

The authors have found that the procedure outlined is simple and satisfactory and that the results are permanent, they have been able to follow up some of the patients for years. Looking at the deformity both from the psychological and the prac-

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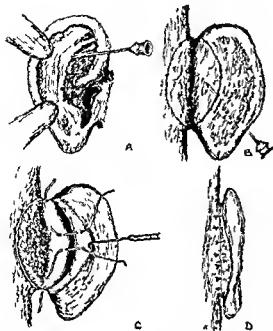


Fig. 1. Schematic diagrams showing the steps in the operation for the replacement of prominent ears. *A* The ear is placed in its normal position against the head and the upper and posterior limits are marked on the scalp with a hypodermic needle dipped in brilliant green 5 per cent in alcohol. Note two punctures above the ear and one behind. With the ear in this position the undeveloped anthelix will reform sufficiently to indicate the line of proposed reconstruction. Along this line with a hypodermic needle dipped in the brilliant green solution punctures are made completely through the ear and about 1 cm. apart. *B* Shows the puncture marks and the needle emerging on the posterior surface of the ear through one of them. The needle shown in the drawing is comparatively much larger than that actually used which is 25 gauge and 1 inch long. The points of perforation are connected with a line of brilliant green and while the solution is still damp the ear is pressed against the head and a contact line is made. This line is freshened with the green solution and the ends are carried forward and joined making an elliptical shaped pattern. The area of skin thus outlined is that which is to be removed. *C* The skin has been removed. The marks of the perforation in the skin can be seen. The second line of green stained dots are those left in the cartilage by the needle punctures through the ear. The area from which the cartilage was excised which conforms to the curve of these perforations is shown. The cartilage spring has been broken. Two sutures of catgut of the type used to turn in the cartilage edges to form the anthelix can be seen placed in the perichondrium. *D* The ear assumes normal position and the skin is closed with end-mattress sutures of horsehair.

tical standpoints they believe that the restoration of prominent ears to normal position is without doubt justified and advisable.

JAMES C. BRASWELL, M.D.

NOSE AND SINUSES

Smith H. B. and Nickel A. C. The Treatment of Subacute and Chronic Sinusitis by Roentgen Radiation. *Am. J. Roentgenol.* 103: 39, 1917.

Smith and Nickel state that moderate doses of filtered roentgen rays from 150 to 200 roentgens are of great benefit in the treatment of various types of paranasal sinusitis.

The most satisfactory results are secured in those cases which present a nasal membrane lining resembling an acute vasomotor rhinitis membrane.

Cases of acute sinusitis which may require surgery should not be treated with roentgen rays.

JAMES C. BRASWELL, M.D.

NECK

Ladd W. E. and Gross R. E. Congenital Branchiogenic Anomalies. A Report of 82 Cases. *Am. J. Surg.* 1918, 39, 234.

The authors review, from the records of the Boston Children's Hospital, a series of 82 cases of branchial cyst or fistula or cartilaginous cutaneous tab believed to have been derived from the branchial apparatus. Of these 34 were cases of lateral cervical cyst, 15 of lateral cervical fistula, 10 of auricular or preauricular sinus and 1 of cervical cutaneous tabs containing cartilage. Of the 82 patients, only 47 were subjected to operation. The remainder were not operated upon because the lesion was small and the symptoms insignificant or because of the presence of some other illness which made it advisable to defer operation.

Lateral cervical cysts, branchial cysts and congenital cysts of the neck appear in the anterior triangle and are never seen behind the sternocleidomastoid muscle. While the lesions may be found anywhere along the anterior border of this muscle they are most apt to be found opposite the middle third. They vary in diameter from 1 to 5 cm. and have little mobility, particularly if infection has been present previously. They usually do not enlarge progressively but may vary in size from time to time because of a spontaneous external discharge of contents through an associated cutaneous fistula or internal drainage into the pharynx by way of a small communication. Through these channels infection of the cyst often occurs. The differentiation from acute suppurative cervical adenitis and tuberculous adenitis may be difficult but the history of a pre-existing swelling usually aids in the diagnosis. Wangenstein, who suggested roentgenography after the injection of iodized oil into the lesion, states that the finding of a smooth walled cavity in the roentgen film is practically diagnostic of branchial cyst.

A lateral fistula, lateral cervical fistula or persistent branchial clefts presents a variety of clinical findings. The tract may be complete i.e. extend from an external opening in the neck into the pharynx or may be incomplete i.e. extend from an external opening into the tissues of the neck. The



Fig 1 Bilateral pedunculated tabs of the neck in an infant. Each lesion contained a rod of cartilage extending upward for 1 cm along the medial border of the sternocleidomastoid muscle.

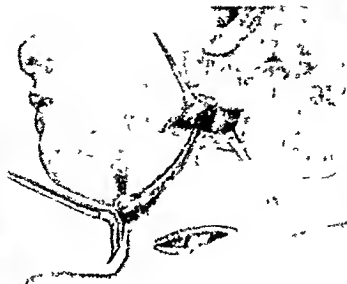


Fig 2 Scheme of operative incisions for removal of a branchial cyst or fistula. In the lower incision, an elliptical piece of skin includes the cutaneous orifice of the sinus. If the tract is long, and extends up to the pharynx, a second incision is made superior and posterior to the first. The sinus tract can then be brought out through this higher wound and the dissection can be carried above this level. The displacement from these horizontal wounds is minimal.



Fig 3 Small sinus which opens on the anterior portion of the helix. The sinus led downward and forward for a distance of 1 cm. (Courtesy of Am J Surg.)

external opening in either case most commonly occurs along the lower third of the anterior border of the sternocleidomastoid muscle. The presenting symptom usually is mucoid discharge. Recurrent episodes of secondary infection are frequent.

Pre-auricular and auricular fistulas often pass without notice but may serve as a focus of recurring infection. These small fistulas may open on the anterior part of the helix, the tragus, the lobule, and most commonly immediately in front of the ear. The tract leads forward from the external orifice for from 1 to 1.5 cm and never has an internal opening. The discharge is never very great.

Cartilaginous rests of the neck are pedunculated or sessile tabs which may be unilateral or bilateral. In none of the cases has there been an associated external fistulous opening.

The authors believe from a correlation of embryological facts and clinical findings, that lateral cervical cysts and fistulas develop most commonly from the second branchial cleft and branchial pouch. Congenital sinuses of the ear and pre-auricular region are believed to develop from an incomplete fusion of the lobules which normally coalesce to form the ear. Lateral cartilaginous pedunculated or sessile tabs of the neck would appear to represent anomalous formations from the second or third branchial arch.

Small auricular and pre-auricular sinuses can be treated by the injection of sclerosing fluids or by endothermy coagulation. When recurrent infection has been present with consequent destruction of the subcutaneous tissue, the lesion is best treated by excision. If a cervical fistula is small and has little discharge, no treatment is necessary. If discharge is profuse or if repeated infection has been present, the entire tract should be excised. A lateral cervical

cyst should be excised together with the communicating tract when present. The operative incision for neck lesions should be made in a transverse direction. In those cases in which extensive dissection of the neck is found to be necessary, adequate exposure can be obtained by the use of a second horizontal incision at a higher level.

ARTHUR S W TOUROFF, M.D.

Hare, H. F., and Swinton, N. W. Cancer of the Thyroid. *J Am M Ass*, 1938, 110: 327.

Cancer of the thyroid is not a rare form of malignant process. In a series of 15,522 operations on the thyroid, primary malignant disease of the gland was seen 314 times, an incidence of 2.4 per cent.

The pre-operative diagnosis of cancer of the thyroid is not accurate or satisfactory. The typical picture of a large, firm, nodular mass in the neck, with extension into the regional lymph nodes, tracheal obstruction, and loss of weight represents the end stages of thyroid cancer. Firm nodules in the thyroid gland, or a history of rapidly growing discrete tumors, is suggestive of malignancy, yet, in many cases the differential diagnosis of early thyroid cancer, thyroiditis, adenoma with recent hemorrhage or calcification, and non-malignant simple discrete adenoma of the thyroid is not possible. A microscopic study of removed tissue by a pathologist who is familiar with thyroid disease must be done to establish the diagnosis.

Surgical treatment alone has proved to be unsatisfactory. If improved end-results are to be attained in the treatment of all thyroid neoplasms, emphasis must be placed on adequate postoperative radiation therapy. The cancerocidal dose is between 3,000 and 4,000 roentgens delivered to the tumor. Once the diagnosis has been established by a pathologist,

irradiation therapy up to this amount should be given in all cases

SAMUEL KAHN, M.D.

Schmiegelow, E. The Surgical Treatment of Chronic Cicatricial Stenosis of the Larynx. *J. Laryngol. & Otol.* 1938 53 1

The author states that before attacking stenosis of the larynx itself the tracheal cannula has to be removed as far away from the larynx as possible by means of an inferior tracheotomy. A week later the stenosis itself is exposed freely by splitting it from the outside by means of a laryngotracheal fissure. The form, character and extension of the stenosis are carefully examined.

If diaphragmatic strictures are present they are removed by means of scissors, knives and punch forceps so that the lumen of the stenosed part of the larynx is made as nearly normal as possible. An india rubber drain, about 5 cm. long is then introduced. It is best to use a drain which is slightly wider than the lumen so that it will produce a certain pressure against the walls of the larynx.

The india rubber tube is introduced between the lips of the external wound which are kept apart by means of retractors and the drain must be laid so that its ends extend outside the narrowed part of the windpipe. The upper end of the drain lies in the larynx but is not allowed to protrude into the pharynx; it is important that it be at the level of the upper aditus of the larynx. If it is too highly placed particles of food can get into the trachea and cause irritation, coughing and, eventually infection of the air passages.

Fixation of the drain is performed transalaryngeally by means of a long, curved, slender perineal needle which is passed from side to side through the soft parts of the neck, the thyroid cartilage and the drain and then a thin silver wire is drawn back through the throat by means of the needle.

When the drain has been correctly placed it is then necessary to control the position of the upper end of the drain which can be done either by introducing the exploring finger through the mouth or by means of indirect laryngoscopy. In children this may be done by direct or suspension laryngoscopy.

The upper end of the drain must come above the vocal cords. Should it be found that the drain was placed too high or too low the position of the drain must be corrected and the transalaryngeal fixation renewed.

JAMES C. BRASWELL, M.D.

Quick, D. Carcinoma of the Larynx. *Am. J. Roentgenol.* 1937 38 821

Clinical experience and the relative frequency of the types of laryngeal cancer suggest that the relative radiosensitivity decreases from within the laryngeal box outward rather in keeping with the changing normal histology. The surgical operability follows this trend from within outward over the gross anatomy, and from the larynx proper to the so-called extrinsic laryngeal parts. Cancer begins primarily

over the latter anatomical parts much less frequently than in the larynx proper.

Metastases are much more frequent and earlier in appearance from cancer usually referred to as extrinsic laryngeal. This may presumably be due in part to the difference in the normal histology of the tissues of origin but chiefly to the more generous lymphatic drainage of the outer zone.

For many reasons, it would avoid much confusion if the terms extrinsic and intrinsic were discarded leaving two groupings of origin only namely, cancer of the larynx (formerly known as intrinsic larynx) with its inlet 'funnel,' and cancer of the hypopharynx.

Surgery of growths herein classed as of hypopharyngeal origin has always given uniformly poor results, and the cases have been ungrudgingly turned over to irradiation by all laryngologists. The relative radiosensitivity of the majority of malignant growths of the hypopharynx is well known.

The author is convinced that roentgen therapy applied in accordance with the basic principles of Coutard represents the backbone of treatment to be employed first in practically every case of true laryngeal cancer acceptable for treatment.

With the treatment of all the cases with intensive roentgen therapy the author emphasizes the value of local and constitutional care as well. At the time of daily examination, preceding the irradiation the throat is carefully cleansed with alkaline preservatives, the nasal mucosa is humken slightly with ephedrine to improve and encourage nasal breathing and the entire upper mucous membrane tract is oiled finally with an oil spray. A liver fraction is given parenterally at the same time to maintain or improve the blood level. Blood counts are carefully checked once or twice weekly to govern the dosage of liver extract and to indicate especially any drop in the leucocyte count or any alteration in the differential count. The patient is instructed to irrigate his throat with warm alkaline solution at frequent and fixed intervals. A mild aromatic oil spray should always follow the irrigation. The diet is carefully supervised.

In the author's opinion, radium now occupies a more limited yet a much more definite and dignified position in the treatment of laryngeal cancer. In certain of the advanced and more resistant cases and in some recurrent cases with thyrotomy exposure it affords a means of salvage that is not possible when roentgen irradiation alone is used to determine when to make a change.

The author believes that the present status of irradiation therapy renders total laryngectomy obsolete. The more conservative operation of thyrotomy for access and at times for drainage is extremely valuable in conjunction with irradiation. The early cancer is as amenable to irradiation as to surgical extirpation and the ultimate result is better. The real problem is the more advanced case in which surgery never has been interested. JOSEPH K. NAKAT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Hyndman, O. R.: Cerebral Pneumography: Ventriculographic Interpretation of Tumors in and about the Third Ventricle, Aqueduct of Sylvius, and Fourth Ventricle. *Arch Surg*, 1938, 36 245

This is a paper which is definitely in favor of air studies not only in the absence of localizing signs of brain tumor, but also to amplify and confirm these signs in order that the most precise surgical approach to the lesion can be made. The article is very detailed, well illustrated, and well written. There are 26 case histories, in most instances with their related ventricular studies. The plate of the air injection is accompanied by a small illustrative diagram and view of the tumor as seen at operation or at autopsy, the whole giving a very complete picture of the surgical problem and its solution.

Explorations are frequently done in cases in which the absence of precise knowledge of the extent and exact position of a tumor lead the surgeon to make an inadequate exposure (Fig 1). This evil can be obviated by air studies. Neurological examination is in no way decried, and it is carefully pointed out that ventriculography cannot take the place of a thorough examination of the nervous system.

There are some excellent plates of tumors of the third ventricle, and of suprasellar cysts and tumors.

In another case (Fig 2) the author made use of ventricular puncture and air studies, and later injected air by the lumbar route, thus getting a complete picture of the ventricular system and the subarachnoid space. He believes that with the ventricular needle *in situ* there is very little danger from this procedure. The roentgenograms are certainly very conclusive. This method was adopted in several other cases and very strikingly clear-cut pictures were obtained. Even in the ordinary ventriculogram an effort should be made to remove as much spinal fluid as possible.

Preceding the actual subject matter of the paper there is a discussion on pneumography in general which includes a description of the technique employed by the writer.

Tumors of the third ventricle may be difficult to differentiate from those of the vermis, but in the former the third ventricle is visualized and there is a characteristic deformity of the aqueduct. Tumors of the vermis produce a constant forward displacement of the fourth ventricle and the distal segment of the aqueduct of Sylvius.

Figure 3 was obtained by ventricular puncture only. However, sometimes it was found necessary to introduce air by the lumbar route in order to obtain visualization of the aqueduct and fourth ventricle.

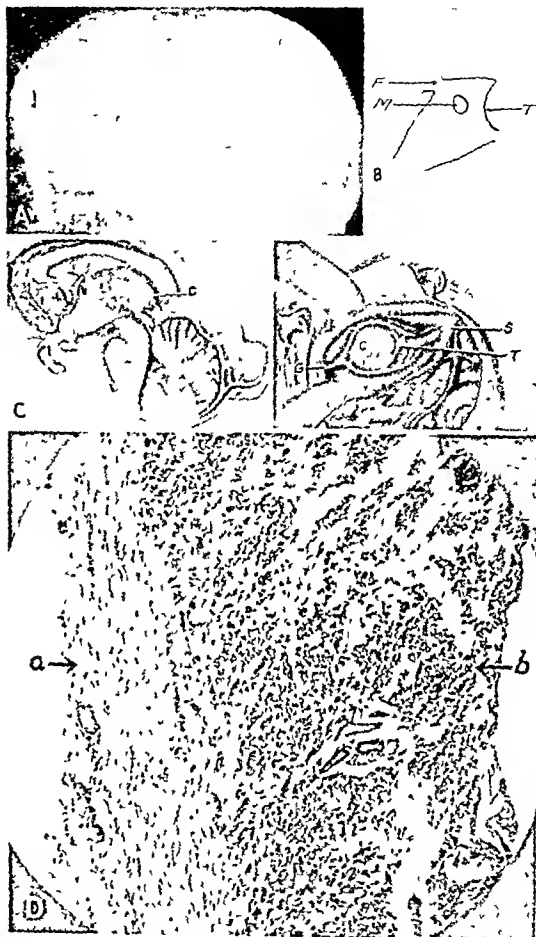


Fig 1. A is a ventriculogram demonstrating a filling defect in the posterior aspect of the third ventricle. B is a diagrammatic representation of A. F indicates the foramen of Monro, M, massa intermedia, T, margin of filling defect due to a benign cyst of the third ventricle. C shows reconstructed drawings illustrating the position and relations of the cyst and the operative approach through the splenium of the corpus callosum. C indicates cyst, G, vein of Galen dividing into the smaller veins, S, divided splenium of the corpus callosum, T, incised tela choroidea. D is a photomicrograph of a cross-section of the cyst wall. a indicates the connective tissue capsule and b indicates the inner aspect of the cyst, composed of many layers of glial cells.

In the body of the paper there are discussed 4 cases of suprasellar cyst or tumor, 2 tumors of the third ventricle, 1 tumor of the thalamus, 1 tumor of the lateral ventricle, 1 tumor of the quadrigeminal

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SAMUEL KAHN, M.D.

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JAMES C. BRASWELL, M.D.

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There were succeeding symptoms in every case of extracerebral neoplasm, as compared with 27 per cent of the intracerebral neoplasms. There was a greater incidence of mental symptoms in the intracerebral neoplasms. The extracerebral group did not present motor symptoms as frequently or as severely as the intracerebral group.

Drowsiness or stupor was not among the symptoms of the extracerebral neoplasms. Eighty-one per cent of the intracerebral tumors as compared with 55 per cent of the extracerebral tumors presented some evidence of dysfunction of the temporal lobe throughout their clinical course.

ROBERT ZOLLINGER, M D

White, J. C., Whitelaw, G. P., Sweet, W. H., and Hurwitt, E. S.: Blood Loss in Neurosurgical Operations. *Ann Surg*, 1938, 107 287

The results reported here are based on 37 neurosurgical operations by three surgeons. It was found that in simple craniotomies the average blood loss amounted to between 500 and 900 c cm. In patients with relatively avascular tumors, the blood loss was between 600 and 1,200 c cm. In three patients with large meningiomas, the hemorrhage exceeded 2,000 c cm. In 5 laminectomies the blood loss varied from 334 to 1,263 c cm. In 2 patients in whom cervicothoracic ganglionectomy and section of the fifth cranial nerve were carried out, the bleeding amounted to only 107 and 86 c cm. When these findings are contrasted with the 200 c cm of blood lost during the average celotomy, the excessive bleeding which occurs in most neurosurgical operations is clearly appreciated.

Profuse hemorrhage in neurosurgical operations is the result of the extreme vascularity of the scalp and of the muscles of the back, bleeding in the course of elevation and closure of the bone flap, or resection of spinal laminae, and the difficulty in rapidly locating and controlling the vessels situated in the depths of the wounds following the removal of tumors.

Experience with transfusion donors has shown that a healthy individual can withstand a sudden bleeding up to 500 or 600 c cm, and that hemorrhages above this amount will cause characteristic symptoms of shock. Although a liter of blood is lost during the average operation for brain tumor, the patients rarely go into surgical shock unless the hemorrhage is rapid, or unless it exceeds 1,200 c cm. Such extensive hemorrhages are tolerated only when they occur gradually during three or four-hour operations.

In addition to the blood loss, the authors have shown that there is a loss up to 1,000 c cm of fluid from the skin and lungs in a patient undergoing operation for brain tumor. To counteract the loss of blood and fluid during these operations, an intravenous infusion of 5 per cent glucose in normal saline solution is given at the beginning of every extensive operation, and from 500 to 1,500 c cm of fluid are allowed to run slowly during the operation. When

it is estimated that a liter or more of blood has been lost, a transfusion is given before the patient is sent to the ward. After hemorrhages exceeding from 1,200 to 1,500 c cm, or whenever the blood pressure remains at a critically low level, multiple transfusions are given. Proper choice of the anesthetic is a valuable means of reducing hemorrhages in these operations. General anesthetics, such as ether and nitrous oxide, should be avoided if possible as they increase bleeding. The authors prefer a basal avertin anesthesia, followed by a wide infiltration of the scalp with a 1 per cent solution of novocaine-epinephrine. In patients who cannot tolerate avertin, phenobarbital, nembutal, or paraldehyde narcosis may be substituted.

DAVID J. IMPASTATO, M D

Mack: The Treatment of Trigeminal Neuralgia with Electrocoagulation (Behandlung der Trigeminalneuralgie mit Elektrokoagulation). *Zentralbl f Chir*, 1937, p 2481

Mack recommends Kirschner's electrocoagulation of the gasserian ganglion for the treatment of trigeminal neuralgia, and states that it succeeds in even the most severe cases. A guide for the needle or "Fuehrungsbuegel" is applied over the skull by a simple method and with its use the location of the gasserian ganglion and its destruction by electrocoagulation is made certain. From five to ten minutes is all the time that is ever required for the puncture and it is not necessary to rely on exciting an attack of pain in the patient at the moment of penetration of the ganglion in order to know that the tip of the needle is at the right spot. The puncture can easily be done under a light eunarcosis or avertin anesthesia.

In the last two years coagulation of the gasserian ganglion has been done 33 times on 23 patients. This material was a selected one consisting of particularly bad cases. The patients ranged in age from thirty-one to eighty-four years, 15 were more than sixty years of age. Twelve patients had already undergone numerous alcohol injections. Of the 23 patients, 15 were permanently free from symptoms after the first coagulation. In 3 cases it was necessary to repeat the procedure from 2 to 4 times in the course of the following year. In 5 cases there was no change in the condition. Two of the 5 failures may be excluded from consideration because the condition present was not a true neuralgia and all other methods of treatment had already failed. One seventy-two-year-old man died of urepsis three weeks after the coagulation. The 2 remaining patients in whom the procedure failed were women aged sixty-three and eighty-four, respectively, one of whom had locked jaws as the result of numerous injections of alcohol, and the other of whom had been addicted to morphine for years. In both of these cases a repetition of the operation was refused.

A few of the patients experienced some difficulty in eating because of the numbing of the buccal mucous membrane on the affected side. However,

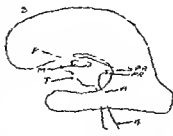


Fig 2 A shows a ventriculogram made by combined ventricular and spinal injection of air. B is a diagrammatic representation of A. F indicates foramen of Monro M massa intermedia SPR suprapineal recess IR pineal recess

cess AS aqueduct of Sylvius 4 fourth ventricle T was gain of filling defect due to the suprasellar portion of the tumor C1 a photograph showing primary polar spongioblastoma in the region of the right fenticular nucleus



Fig 3 A is a ventriculogram demonstrating a forward displacement of the fourth ventricle and the distal segment of the aqueduct of Sylvius. A sharp angular defect is produced in the upper segment of the aqueduct, which has proved to be constant with tumors in or pressing on the vermis cerebelli. The anatomical analysis of this angula

tion may be made B is a diagrammatic representation of A F indicates foramen of Monro M massa intermedia SPR suprapineal recess A aqueduct of Sylvius 4 fourth ventricle C is a drawing of the arachnoid (pia?) cyst described at autopsy

plate 3 tumors of the vermis and 2 cases of arachnoiditis of the posterior fossa

The author believes that ventriculography should be more widely employed to help the surgeon to determine the best possible method of attack on a tumor. Increasing technical efficiency and an increasing courage to attempt the removal of deeply situated lesions make it essential to have a correct knowledge of the position and extent of the lesions because widely differing methods of exposure can be employed for their removal.

It is no longer excusable to explore the cerebellum in the presence of uniformly dilated lateral ventricles unless the status of the third ventricle is ascertained and this can be accomplished by completing the air studies through the lumbar route.

VORLEN VERBRUGEN M.D.

Collins R. T. A Comparison of the Symptoms and Signs of Intracerebral and Extracerebral Tumors Involving the Temporal Lobes. *Bull. Neuro. Inst. New York*, 1917, 6: 410.

The author compares the symptoms of 74 intracerebral neoplasms with 34 extracerebral neoplasms of the temporal lobe. Thirty-four of the intracere-

bral tumors were fibrillary astrocytomas and 23 were multiform glioblastomas while the remainder were divided among various other types. Thirteen of the extracerebral neoplasms were meningiomas. The intracerebral neoplasms were most common between the ages of twenty-one and sixty years while the extracerebral were more common between the ages of thirty-one and fifty years.

The duration of symptoms in the intracerebral neoplasms ranged from four days to one hundred and twenty months as compared with from one month to two hundred and sixteen months for the extracerebral tumors. The duration of symptoms for the 24 cases of meningioma averaged thirty-three and five tenths months. A typical syndrome of the temporal lobe such as uncinate attacks and dreams episodes occurred in about 50 per cent of the cases. The most important localizing signs were contralateral homonymous or quadrantanopic field defects.

The extracerebral neoplasms in the great majority of instances start with a single symptom and never with three or more symptoms. The intracerebral neoplasms frequently start with a single symptom and present a greater profusion of symptoms than the extracerebral group.

alcohol injection, or both, the operative mortality being 136 per cent ADRIEN VERBRUGGHE, M D

Vernet, M.: Paralysis of the Glossopharyngeal Nerve. (A propos de la paralysie du glosso-pharyngien) *Presse méd*, Par, 1938, 46 315

In 1915, Vernet described a rippling movement ("mouvement de rideau") of the posterior wall of the pharynx as a characteristic sign of paralysis of the superior constrictor muscle of that organ, resulting from paralysis of the glossopharyngeal nerve. His further studies have convinced him of the correctness of this opinion.

Paralysis of the superior constrictor muscle of the pharynx on one side results in difficulty in swallowing solids and in the characteristic rippling movement of the posterior wall of the pharynx as previously described. This phenomenon is characterized by a movement of the pharyngeal wall from the paralyzed side toward the normal side, obliquely from above downward, it is a rapid but very characteristic movement, resembling the deviation of the soft palate with unilateral paralysis. This movement is less clearly evident in talking, but is easily demonstrated in swallowing. If paralysis of one side of the soft palate is associated with paralysis of the constrictor muscle, the movement is accentuated.

Anatomically it has been shown that the glossopharyngeal nerve is the chief nerve supply of the superior constrictor muscle. Uncomplicated paralysis of the glossopharyngeal nerve, without involvement of other nerves, is rarely observed clinically, however, the author has observed 2 such cases recently, in which the movements of the soft palate, larynx, and the tongue were normal, but the two typical motor symptoms of glossopharyngeal paralysis were evident, i.e., difficulty in swallowing solids and the rippling movement of the posterior wall of the pharynx. A few similar cases have been reported in the literature.

In the author's recent animal experiments with the section of various cranial nerves, this conclusion has been further substantiated. He has found that unilateral intracranial section of the spinal nerve results in no abnormality of deglutition and no paralysis of the posterior wall of the pharynx. Unilateral intracranial section of the pneumogastric nerve causes no paralysis of the soft palate, of the pharynx, or of the larynx. Unilateral intracranial section of the glossopharyngeal nerve causes no paralysis of the soft palate or of the larynx, but a very definite evidence of paralysis of the pharynx. In the one animal, a dog, in which this operation was done, there was marked difficulty in swallowing solids, and while typical rippling movements of the posterior pharyngeal wall were not demonstrated, the contraction of the wall was more marked on the non-paralyzed side, which thereby produced a somewhat similar effect. If the unilateral intracranial section of the spinal or the pneumogastric nerve or both was combined with section of the glossopharyngeal nerve, the typical syndrome resulted, in some of these animals the rippling

movement of the posterior pharyngeal wall was clearly demonstrated. With unilateral section of the spinal nerve there was also a unilateral paralysis of the soft palate and the larynx. However, with section of the pneumogastric nerve in association with section of the glossopharyngeal nerve, this did not occur, but the rippling movement characteristic of glossopharyngeal paralysis appeared to be accentuated, although with section of the pneumogastric nerve alone, no evidence of pharyngeal paralysis was noted.

Some recent experiments, or clinical results in neurosurgery, seem to contradict the author's conclusions in regard to paralysis of the glossopharyngeal nerve. However, he notes that extracranial section of the glossopharyngeal nerve, which may be done clinically, does not cause paresis of the pharyngeal musculature with the rippling movement and difficulty in swallowing solids. Only intracranial section, before any branching of the nerve occurs, will have this effect. Nevertheless, in a few instances intracranial section of the glossopharyngeal nerve does not have this effect, there are three possible explanations.

1. There may be aberrant or anastomosing nerve fibers in certain individuals, animal or man, which prevent the complete interruption of the nerve pathways by section of a single nerve.

2. The action of other muscles, if only the glossopharyngeal nerve is sectioned, may prevent the development of the full syndrome of paralysis of the pharyngeal constrictor muscle.

3. As indicated by the experimental effect of section of the pneumogastric nerve in association with section of the glossopharyngeal nerve, the syndrome of glossopharyngeal paralysis may not be fully evident unless there is some associated sensory disturbance. Pharyngeal paralysis does not develop unless there is an injury to the glossopharyngeal nerve as well as other cranial nerves in the foramen lacerum posterius, if, however, other associated cranial nerves are injured, the signs and symptoms of glossopharyngeal paralysis may be accentuated by associated motor and sensory disturbances. ALICE M MEYERS

SPINAL CORD AND ITS COVERINGS

Campbell, M. M.: Pyogenic Infections within the Vertebral Canal. *Bull Neurol Inst*, New York, 1937, 6 574

The author found in a review of the literature that about 200 cases of pyogenic infection involving the structures within the vertebral canal have been reported. He describes 8 cases in detail.

The symptomatology varies, and depends upon the intensity and extent of the pathological process. Pyogenic infection should be suspected when there is a history or physical evidence of a primary focus in a patient with symptoms involving the spinal cord. There is percussion tenderness over the affected area in practically all cases. A laminectomy should be performed to establish free drainage of the suppurative area and to relieve pressure on the spinal cord.

all of these patients declared that they had quickly accustomed them selves to this slight trouble and that it was in no way comparable to the pains which they formerly had. A mild keratitis neuroparalytica was observed in 2 cases but cleared up in each. There was 1 death attributable to the operation. A sixty two year-old man whose symptoms did not entirely cease after the first coagulation was given a second coagulation three days later. He was discharged free from symptoms on the following day. Three days later he had a severe headache, and meningitis developed. Since then patients have not been discharged until four or five days after a coagulation. A coagulation is not repeated until four weeks have elapsed.

Coagulation of the gasserian ganglion, according to Kirschner is now the method of choice. It is suitable even for patients whose general condition makes them unfit for operation on the ganglion.

In the discussion KIRSCHNER reports further experiences on 380 patients. Eighty seven per cent were completely healed. 5 per cent were relieved of their pain to such an extent that further treatment was unnecessary, in 8 per cent the procedure failed. Only a portion of these patients were freed from pain by Dandy's root division. In these cases the pains had a deeper seat within the brain itself. Meningitis was observed 3 times and only in cases in which the coagulation had been repeated several times at short intervals. Without doubt the infection is brought about by the necrotic foci produced by the first coagulation. The author therefore warns against repeated coagulation at short intervals. In 1 case the optic nerve was accidentally injured because the needle was removed from the guiding apparatus. In a few cases paralysis of the abducens nerve was observed but it cleared up promptly. The greatest danger to be feared today is keratitis neuroparalytica in 3 cases this condition led to severe injury of the eye. The point of the needle must not be introduced more than 0.5 mm above the entrance to the foramen ovale, and in neuralgias of the second and third branches it must not be introduced too much from the side. If the neuralgia involves the first branch only, neurectomy or Dandy's operation is to be preferred. Recurrence was seen in 20 per cent of the cases which were observed for longer than three years but in all of these cases repetition of the coagulation freed the patients from symptoms again. (ERICH HEMPEL) FLORENCE A. CARPENTER

Grant F. C. Results in the Operative Treatment of Major Trigeminal Neuralgia. *Ann Surg* 1923 127 14

This is an excellent statistical study of 949 operations undertaken on 925 patients for the cure of trigeminal neuralgia. Most of the operations were done by Frazier with the routine temporal approach perfected by him.

The problem of the operative treatment of trigeminal neuralgia was viewed from four standpoints: (1) the operative mortality (2) the type of operation

performed (3) the percentage of postoperative complications, and (4) the percentage of complete relief from pain.

The mortality in 949 operations on 925 patients was 1.36 per cent. The 13 deaths were due to cerebral embolism in 7 cases, hemorrhage in 3 cases, meningitis in 2 cases, and pneumonia in 1 case. More than half the deaths resulted from vascular accidents and 83 per cent of the patients were over fifty years of age at the time of operation. No fatalities occurred in 286 consecutive cases.

The type of operation is determined by the distribution of the neuralgia. If possible a subtotal avulsion with preservation of the motor root is done.

The most common and most feared postoperative complications are keratitis and facial paralysis though on rare occasions (1.7 per cent) injury may occur to the third or sixth cranial nerve. Eighty-five cases of keratitis occurred and in 5 of these partial facial paralysis was present. In 6 cases enucleation of the eye was necessary. The figures show that partial root section goes far toward eliminating keratitis. Partial facial paralysis was observed in 33 cases or 3.4 per cent and complete facial paralysis in 6 cases, or 0.65 per cent. All the patients with partial facial paralysis recovered completely. The paralysis was thought to be due either to hemorrhage from the petrosal vein or traction on the petrosal nerve with a resulting pull on the geniculate ganglion of the facial nerve.

The relief of pain was considered under the subheadings of recurrence of pain and paresthesias. Complete relief of the original pain followed operation in 99.2 per cent of the patients. Thirteen and eight tenths per cent complained of paresthesias which were severe in 3.4 per cent. Five and three tenths per cent had recurrence of true trigeminal neuralgia. 7 of 359 patients who had undergone complete ablation of the sensory root and 44 of 590 patients who had undergone partial section of the sensory root. Of the latter group 30 were relieved by supra-orbital avulsion and 3 by reoperation with complete severance of the root. Five were not operated upon.

In 17 patients the pain appeared on the opposite side after it had been relieved on the original side. Of these 5 were relieved by bilateral operations, 2 by alcohol injections, and 10 were operated upon on one side and received alcohol injections on the other. Nine patients were seen with typical trigeminal neuralgia on both sides, all of whom had the radical operation on one side and 7 of whom received alcohol injections on the other. It was shown that preservation of the motor root does not increase the frequency of postoperative paresthesia. Malignant disease of the face, mouth, or paranasal sinuses may be an indication for operation on the fifth nerve.

In conclusion the author states that the operation of choice is subtotal avulsion of the sensory root with preservation of the motor root and that even the most debilitated sufferers from the disease should have the benefit of treatment either by operation or

when this exists. Survival following operation is becoming fairly common and complete restoration of function occurs in about 40 per cent of the patients who survive operation.

The author emphasizes that the terminology should be derived from the causative factor, the pathological phase, and the anatomical site of the lesion rather than from the term 'abscess'. The process should be further classified as acute or chronic in type.

POBERT ZOLLINGER M.D.

Young B. R. and Scott M. Air Myelography: The Substitution of Air for Lipiodol in Roentgen Visualization of Tumors and Other Structures in the Spinal Canal. *Am J Roentgenol* 1938 39 187

This short paper is an attempt to demonstrate the usefulness of air in the spinal canal as a means of localizing certain space occupying lesions. The method has of course been used with success in localizing lesions of the brain for the last twenty years. Hitherto it has been necessary for some to use lipiodol to determine the exact position of certain spinal cord lesions. This frequently produces ill effects while air is relatively innocuous. In the cases selected by the authors air was injected into the spinal canal and trapped by the lesion. Roentgenograms taken in the sitting position then showed the trapped air at the level of the lesion. It was found that it was necessary to inject only from 3 to 6 c.c. of air.

There were 13 cases in the series in which the level of the lesion was demonstrated by air myelography and confirmed by laminectomy. 5 of these presented protrusions of the nucleus pulposus and 8 of the spinal cord. ADRIEN VERBERGHE M.D.

Bradford F. K. Intramedullary Dermoid Cyst. *Ann Surg* 1938 107 107

Dermoid and epidermoid tumors within the spinal canal are of infrequent occurrence. About one third are intramedullary among which true dermoid cysts are rare.

Cross in 1934 collected 19 cases of dermoid and epidermoid tumors within the spinal canal and added one of his own. Only 1 of the 20 tumors was a dermoid cyst. Twelve additional cases of such tumors have been noted in the literature since then of which only 1 was found to be a dermoid cyst.

A case of intramedullary dermoid cyst is reported by the author. The patient a three year old boy developed normally until one year before his admission to the hospital when pain occurred at irregular intervals in both lower extremities. Two months prior to his admission the pains became more severe and the lower extremities became too weak for walking although he could be held in a standing position and could take a few steps. The patient also became incontinent of feces and urine though previously he had had perfect control. He had been irritable frequently refused to eat and had lost 7 lb. Examination showed a rather flaccid para-

alysis, perianal analgesia and a palpable defect in the sacral laminae. The left testis was undescended but the genitalia were otherwise normal. A roentgenogram revealed marked dilatation of the lumbal canal. At operation an intramedullary dermoid cyst was evacuated, and a mural nodule was excised.

Following operation there was relief of pain in the lower extremities. Spincter control was regained temporarily, but urinary incontinence recurred. The patient has regained use of the legs and can walk and run easily, but with the trunk flexed forward. There is weakness of the dorsiflexors of the right ankle though sensory examination and tendon reflexes are normal.

Microscopic examination of the fluid removed at operation revealed many large flat polyhedral cells which were concluded to be squamous epithelial cells. The nodule removed showed a stratified squamous epithelial lining of which about half was cornified. The dermis contained fat, hair follicles and sebaceous gland. Macroscopically, at operation there were seen several masses of caseous material in which were tangled many fine blood hairs.

These findings represent a developmental defect in the cleavage of the surface and neural ectoderm that is similar to the developmental anomaly responsible for the extramedullary dermoid and epidermoid tumors and the congenital dermal sinuses. In this particular instance the bit of surface ectoderm which was responsible for the tumor remained firmly attached to the neural groove and became ensfolded within that structure upon its closure to form the neural tube. It is probable that the nodule represents the original implant and that the cystic cavity and its lining of stratified squamous epithelium have resulted from secretion from the dermoid nodule and the progressive enlargement and lining of this cavity from the epithelium present on the nodule. It is hoped that removal of the dermoid nodule will terminate this progressive process since extirpation of the epithelial lining of this large cyst was not feasible. EDWARD S. LACY M.D.

SYMPATHETIC NERVES

Stark J. S. and Abrams J. Neuroblastoma: A Childhood Type of Malignant Tumor of the Sympathetic Nervous System. *Radiology* 1938 30 221

Two cases of neuroblastoma which were encountered within one year are reported. Neuroblastomas are malignant tumors derived from neuroblasts which are products of the germ cells, one of the two main divisions of the nerve cells of ectodermal origin. The neuroblasts are the precursors of the neurons and also of the migrating cells which develop from the ganglionic cells, the anlage of the sympathetic nervous system. The primitive neuron elements are more apt to exist in the sympathetic nervous system than in the central nervous system and neuroblastomas are generally found in the sympathetic chains and in the adrenal cortex usually in the latter.

Virchow, in 1864, first guessed at the nervous-tissue origin of these congenital suprarenal tumors, but he regarded them as gliomas. Wright, in 1910, first properly named them neuroblastomas. The characteristic rosette appearance of a roughly circular formation of small, round, highly undifferentiated cells about a bundle of fibrils occurs in only about one-third of the cases. Therefore it is sometimes impossible to make a definite diagnosis from the pathological specimen alone. In the absence of rosette formation the microscopic appearance is similar to that of Ewing's tumor and other highly undifferentiated neoplasms.

Neuroblastoma usually occurs during infancy or childhood, and is exceedingly malignant. It is extremely rare in adults, and Boyd believes that a diagnosis of neuroblastoma in the adult is very risky. Ritter reported 2 cases of a relatively benign nature in adults. The tumors were located in the intestines, with metastases to the adjacent lymph nodes. Pepper, in 1901, and Hutchinson, in 1907, described different types of neuroblastoma which are now identified by their names. In the Pepper syndrome the tumor starts in the suprarenal gland, usually on the right side, and metastasizes to the liver and adjacent lymph nodes. The enlarged liver may fill the greater part of the abdomen, usually without jaundice. In the Hutchinson type metastasis occurs to the skull, especially to the orbit, and to other bones.

There is generally an ecchymotic spot about one eye, followed by unilateral exophthalmos and tumor of the temporal region. The Pepper group usually occurs in infancy, while the Hutchinson group is more common in childhood. Only with metastasis to the osseous system is there roentgenological evidence of neuroblastoma.

Radiation therapy has been of no value in treatment, except to give an apparent temporary response in one case reported by Hauser. Apparently the response of neuroblastoma metastasis to radiation is similar to that of carcinoma metastasis.

Two cases are reported. In 1 the primary lesion was in the upper sympathetic ganglion instead of the more usual site in the adrenals. There were no orbital findings such as are usually seen in the Hutchinson type. The skeletal changes in the frontal region of the vault of the skull were sufficient to warrant a diagnosis of probable neuroblastoma, which was confirmed at autopsy. In the second case there was unilateral disease of the bones, in the right scapula, hand, tibia, and eleventh rib. These osseous lesions were discovered three years prior to the discovery of the suprarenal tumor, which indicated that they were independent of the neuroblastoma. The assumption was that this was a case of osteodystrophia fibrosa unilocalis rather than bone metastasis. It was unfortunate that no biopsy was obtained of any of the bone lesions.

EDWARD S. PLATT, M.D.

when this exists. Survival following operation is becoming fairly common and complete restoration of function occurs in about 40 per cent of the patients who survive operation.

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paretic perineal analgesia and a palpable defect in the sacral laminae. The left testis was undescended but the genitalia were otherwise normal. A roentgenogram revealed marked dilatation of the lumbar canal. At operation an intramedullary dermoid cyst was evacuated and a mural nodule was excised.

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SYMPATHETIC NERVES

Startz I. S. and Abrams J. Neuroblastoma A Childhood Type of Malignant Tumor of the Sympathetic Nervous System. *Radiology* 1938 30 232

Two cases of neuroblastoma which were encountered within one year are reported. Neuroblastomas are malignant tumors derived from neuroblasts which are products of the germ cells, one of the two main divisions of the nerve cells of ectodermal origin. The neuroblasts are the precursors of the neurons and also of the migrating cell which develop from the ganglionic cells the anlage of the sympathetic nervous system. The primitive neuron elements are more apt to exist in the sympathetic nervous system than in the central nervous system and neuroblastomas are generally found in the sympathetic chains and in the adrenal cortex, usually in the latter.

of appreciable size; and adenosis, characterized by proliferative changes resulting in the formation of many nodules in both breasts, the so-called shotty breast

An indifferent type of chronic cystic mastitis is common to the early phase of both cystic disease and adenosis. This indifferent stage, referred to as mastodynia, is more commonly the forerunner of adenosis than of cyst formation. It is characterized by persistent painful breasts, and may be successfully treated by endocrine therapy usually estrogen administered intramuscularly twice a week in doses of 10,000 international units over a period of several months.

The treatment of the adenosis type of chronic cystic mastitis with estrogen is, in general, highly successful. Pain is relieved and most of the nodules and areas of increased density disappear or are reduced in size. A tendency to recurrence is often noted, but this can usually be controlled with single injections of 10,000 international units given each month in the premenstruum.

Lasting results are more difficult to achieve with endocrine therapy in the cystic form of the disease, and dosage must be more carefully adjusted to guard against overtreatment.

In carrying out the endocrine treatment in these cases, it must be borne in mind that, in general, the various forms of chronic cystic mastitis are self-limited and tend ultimately to regress. The hormone therapy is a convenient form of palliative treatment and speeds the regression of the disease. Successful therapy requires relatively high doses of estrogen, 10,000 international units are injected intramuscularly twice weekly for a period of three weeks between two menstrual periods. This is followed by similar doses injected once a week for another month, then twice the following month. After this a single injection is given in the premenstruum, or capsules are taken by mouth every other day to complete six months of treatment. The oral preparation used is amniotin in capsules containing 2,000 international units of estrogen each. The estrogen is never given during menstruation.

The performance of single or bilateral mastectomies in these cases is not indicated. The condition is benign and unrelated to cancer.

SAMUEL KAHN, M D

Contini, V.: Tuberculosis of the Mammary Gland (La tubercolosi della mammella) *Arch Ital di chir*, 1937, 47 601

Contini states that about 250 cases of primary tuberculosis of the breast have been reported altogether in the literature. Concerning the pathogenesis of this relatively rare involvement of the mammary gland, the general consensus of opinion among the various authorities is that the infecting organism may be disseminated in one of four ways (1) by way of the blood stream, (2) by lymphatic dissemination, (3) by way of the lactiferous ducts, and (4) by extension.

Anatomicopathologically 4 types of acid-fast infection of the breast have been described (1) the milary type, characterized by the presence of small nodules, (2) the granulomatous type with formation of large nodes, (3) the destructive type with the formation of cold abscesses, and (4) the sclerotic type, which usually appears as a scirrhous lesion.

In studying the pathogenesis of this condition, Contini conducted a series of experiments on non-lactating and lactating guinea pigs. He injected an emulsion containing tubercle bacilli of the human type directly into the mammary gland, into the inguinal region, and into the jugular vein. The breasts of those animals which were injected intravenously with the organism were subsequently traumatized. The animals were killed at various intervals after the inoculation and the changes in the breast tissue were studied histologically.

In general, the author found that the mammary gland is markedly refractory to acid-fast infection. Positive results were obtained only when the tubercle bacilli were inoculated directly into the breast tissue and into the lactiferous ducts. When the infecting organism was inoculated directly into the blood stream, positive results were obtained only when the inoculation was followed by a trauma of the breast, or when the mammary gland was functionally active. Inoculations into the inguinal region yielded always negative results, and the author therefore questions the possibility of a retrograde acid-fast infection of the mammary gland by lymphatic dissemination.

Contini found that pregnancy, lactation, and trauma are decided predisposing factors to acid-fast infection of the mammary gland. He found also that tuberculosis of this gland is never localized but is always accompanied by an involvement of the viscera. It is believed, therefore, that the artificial local infection produces always a generalized systemic one.

The author suggests that primary tuberculosis of the breast is found only in cases in which the infection was produced either directly or by way of the lactiferous ducts. In all other cases the condition should be considered as secondary. He also agrees with other authors that the giant cells observed in acid-fast infections of the breast are usually of parenchymal origin, in the glandular acini, and only very rarely of epithelioid origin.

RICHARD E SOMMA, M D

Lewis, D., and Geschickter, C F: Comedo Carcinoma of the Breast. *Arch Surg*, 1938, 36 225

The name comedo carcinoma is given to tumors of the breast which, when cut, permit plugs of tumor cells to be expressed from the ducts, much like the plug or comedo expressed from an ordinary blackhead. The authors believe that this is a distinct type of duct carcinoma differing from a papillary carcinoma of the ducts. It may be diffuse or localized.

Clinically the diffuse type grows slowly and may involve the greater part of the breast. Frequently

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Sowles H. K. A Plastic Operation for the Correction of Hypertrophy of the Breast. *New Eng Land J M* 1938 218 253

Hypertrophy of the female breast is a common affliction and may involve one or both breasts. The degree of pendulosity is increased by lactation periods and also by the wearing of a compression brassiere which tends to increase the elongation. Large breasts are a source of considerable discomfort because of their weight; they cause the shoulder straps of brassieres to dig into the tissues; they may cause faulty posture; the patient is deprived of the privilege of wearing certain types of gowns; and some sensitive patients come to regard their deformity as a handicap and therefore deprive themselves of many normal activities.

There are 20 photographs which demonstrate the highly satisfactory results obtained by this author in reducing and reshaping hypertrophied breasts. The operation he uses is a modification of the Diesinger procedure. He finds it difficult to describe the operation adequately but a group of 8 drawings in connection with the text help to visualize the successive steps. The postoperative dressing is very important. Plenty of sheet wadding is used over the gauze dressing and then a scultetus swathe is applied in such a way that it fits firmly and smoothly. Each tail is pinned to prevent loosening and shoulder straps are attached to prevent slipping. The dressing is left undisturbed for one week. The author advises a two-stage operation with an interval of ten days between the first and second stage.

J. DANIEL WILLIAMS M.D.

Otte W. The Treatment of Mastitis (Ueber die Behandlung der Mastitis). *Monatsschr f Krebshkpfh* 1937 5 277

In 1936 at the Polyclinic for Tumors of the Charité Hospital in Berlin 16.7 per cent of all the patients were treated for mastitis; 15.4 per cent for carcinoma of the breast and 3.4 per cent for benign breast tumors. Mastitis deserves attention because of its polymorphism, the necessity of differentiation from malignant disease and its operability in the early stages. It can be divided into two main types.

The first type includes puerperal infectious mastitis, metastatic mastitis and mastitis of the newborn and adolescent. The second type includes interstitial mastitis and chronic cystic mastitis (mastopathia cystica).

Mastitis in the puerperium toward the end of the first month often leads to suppuration and erysipelas. It is usually localized to one side and is acute. In older women the condition takes a chronic form and a firm capsule without fluctuation and adhesions to the skin is found.

Metastatic mastitis occurs after typhus fever, dysentery, mumps and influenza and is usually bilateral.

Mastitis in the newborn leads to Hensenmilch or milk in the breast of the newborn child. In the adolescent it causes swelling about the time of puberty which very seldom leads to suppuration; support, rest and incision are sufficient for treatment.

The second type of mastitis may easily be confused with cancer. In interstitial mastitis there is usually a development of unilateral induration of the glandular stroma and the formation of an irregular tender mass, sometimes more than one mass. There is never any attachment to the skin. These masses occur between the ages of twenty-one and sixty-one but most frequently after the forty-eighth year in other words during the menopause. The pain and heaviness of the breasts are clearly related to the menstrual cycle. The piercing pains radiate from the margin of the pectoralis major into the axilla where in some cases enlarged glands may be found. Such an observation is never made in cancer of the breast because this condition is painless unless ulcerated and its development is independent of the ovarian cycle. An extensive operation is unnecessary in interstitial mastitis. Anatomically we find fibrous tissue and the sparse glandular ducts are infiltrated with round cells.

In chronic mastitis small and large cysts which fluctuate, heavy breasts and aching and piercing pains which are always related to the menstrual cycle are found. The differential diagnosis from fibro-adenoma is difficult if fluctuation of the cysts cannot be demonstrated. The treatment is operative. The pectoral muscles and the axilla should remain untouched.

In interstitial mastitis the treatment is expectant and for the relief of pain usually with ovarian preparations. Seventy-two percent of the cases received complete relief; the most of them from progynon and eukliman. Continued observation is necessary because of the danger of malignant degeneration.

(ROGGER) JOHN A. CRUS M.D.

Lewis, D. and Geschickter, C. F. Endocrine Therapy in Chronic Cystic Mastitis. *J. Am. M. Ass.* 1937 109 1803

The term chronic cystic mastitis is applied to a benign lesion of the breast which is thought by many to be precancerous in nature. It is neither inflammatory nor strictly neoplastic. Recent studies seem to indicate that the changes in the breast in this disease are associated with disturbances in one of the glands of internal secretion.

In its later clinical stages chronic cystic mastitis may be divided into two types: cystic disease characterized by the development of a number of cysts

roentgen study of the chest, spine, and pelvis for metastases should be made without regard to the small size of the primary tumor or the lack of suggestive symptoms

If patients with the aforementioned conditions are excluded from operation, 40 per cent of all the other patients operated on may expect to be free from disease for five years, with a small percentage dying of cancer later. If the postoperative pathological study reveals only a localized cancer, over 60 per cent may expect a five-year cure, whereas only 20 per cent remain free from recurrence for five years when metastases to the axillary nodes can be demonstrated by the pathologist

Cancer of the breast is relatively resistant to irradiation, so that daily treatments over long periods of time are necessary to obtain sufficient effect on the cells. This effect is achieved in two ways (1) by the destructive action on the cell itself with consequent disintegration, and (2) by the stimulation of fibrous tissue formation with resulting inclusion of the cells by fibrous tissue, which in turn obliterates the lymph and blood channels to the areas involved. However, there is no assurance that the tumor cells may not take on renewed activity later.

Pre-operative irradiation has been advocated on various grounds. For the present White believes that not enough evidence has been brought forward to warrant insistence that the patient submit to pre-operative therapy.

Postoperative roentgen irradiation has received rather wide support as an aid to radical operation. Up to 1931 such treatment did not increase the expectancy of five-year freedom from disease. The methods of administering radiation have changed since then. At the present time White and his associates attempt to give the patient 2,000 roentgens in four or five portals to include the breast area, mediastinum, supraclavicular area, the upper part of the chest, and the axilla, with both posterior anterior (Coolidge tube in front) and anterior posterior (Coolidge tube from dorsum) covering of these areas. The treatments are given during a period of from twenty to thirty days. With this method the author has gained the impression that the percentage of local recurrence is being reduced, but it is too soon to form a definite opinion.

Roentgen castration in cases of primary cancer has been advocated. It is proper to observe that this method has not yet been used long enough or widely enough for final judgment. There seems to be no question of its merits in restraining the growth of cancer of the breast for a while, especially in women under forty-five years of age. Whether the restraint is long enough in primary cancer to warrant castration, with all its secondary physical and mental effects, is a question of judgment and one which only time and experience will answer.

Interstitial irradiation with radium or radon has been used in conjunction with surgical treatment at the time of operation. White has not had sufficient experience with this type of treatment to pass critical

judgment. The results do not justify its use in place of surgery except under special conditions, such as heart disease or debilitating constitutional disease.

The author concludes that meticulous radical operation is definitely indicated for all operable cancers of the breast. This requires a careful following of the teachings of Halsted and Handley. Pre-operative irradiation treats the lesions in the operative field, and it may, therefore, be of help in restraining or preventing local recurrence. Postoperative irradiation should be of advantage in preventing or retarding recurrence in the operative field, but it has so far not increased the five-year postoperative expectation of freedom from the disease. J. DANIEL WILLEMS, M.D.

Šprindrich, J. The Importance of X-Ray Therapy of Cancer of the Breast (*Die Bedeutung der Roentgentherapie beim Brustdrüsenkrebs*) *Bratislav lek Listy*, 1937, 17 415

On the basis of the literature Šprindrich first describes the present status of roentgen treatment of cancer of the breast. Then he relates his experiences at Olmuetz and later at Bruenn. The cases are divided into 4 groups according to the classification of Steintal, which is based on the gravity of the condition. During nine years the author observed the fate of 297 patients. Of these 170 were irradiated at Olmuetz, 3 of these were inoperable. After the radical operation of Anschuetz, 167 were given prophylactic irradiation. Twenty-three per cent returned with metastasis or recurrences, while many could not be followed up. At Bruenn 157 cases were treated, 127 received roentgen irradiation, and of these only 26 were operable, 33 had been operated upon somewhere else, and 97 were inoperable because they presented metastasis or recurrence.

In one case the patient, in whom the first metastasis became evident in her shoulder joint after the lapse of one year, and in whom further metastases were revealed in the femur and in the vertebral column, is now living eleven years after the operation and roentgen treatment, without any symptoms, and in good condition.

The method of procedure may be described in brief as follows:

Cases of Group I are operated upon radically, then roentgen treatment, although not imperative, is recommended.

In Group II the same procedure is used except that every patient is given roentgen treatment. Young patients are irradiated before the operation, then the operation is performed with the electric knife, and then roentgen irradiation is given again. In older patients, sometimes only the pectoral gland is removed and then roentgen treatment is given according to Borak. Of 26 patients so treated, 14 lived more than a year without recurrence, only 1 returned with a recurrence.

Patients of Groups III and IV are treated with roentgen or radium irradiation, these treatments are sometimes quite successful. The radiation is applied

there are no palpable axillary lymph nodes even when almost the entire breast is involved. Small elevations of the skin may be present over the tumor because of protrusion of the epithelial plugs within the ducts.

In the localized form the tumor varies from 1 to 3 cm in diameter. It is usually situated at the margin of the areola just beneath the skin and is freely movable. The tumor is harder and firmer than an intracystic papilloma and a blue dome cyst. Atrophy of the overlying fat is frequent.

In either the diffuse or localized type of comedo carcinoma a watery milky or yellowish discharge from the nipple is often pre-ent. Retraction or fixation of the nipple is frequent. Occasionally burning and itching of the nipple may occur.

One third of the patients observed by the authors were under the age of forty five years. About 25 per cent had known the tumor to be present for two years and it had been present five years or longer in 6 patients.

Of all forms of carcinoma of the breast comedo carcinoma offers the most favorable prognosis. The authors observed five year survival in 85 per cent of the patients, a better prognosis than in Paget's disease. The majority of the patients living five years after operation remained well for ten or more years. Axillary metastases are not necessarily fatal to the patient. Local excision is usually followed by recurrence. Radical operation for recurrence performed a year or more after local excision offers hope of a cure even in the presence of axillary metastases.

The authors give a histological description of the tumor.

JARLO LATIMER M.D.

Harrington S W. Unilateral and Bilateral Carcinoma of the Breast. *Minnesota Med.* 1938 31 1.

A review has been made of all cases of carcinoma of the breast encountered at the Mayo Clinic from 1910 to 1933 inclusive. Of the total of 463 patients 97.4 per cent have been traced three years or more and the results of operation have been determined for three, five, ten, fifteen and twenty year periods in cases of unilateral carcinoma of the breast, bilateral carcinoma of the breast and Paget's disease.

The best surgical results were obtained in cases in which metastasis to the lymph nodes had not taken place. In this series of 4628 cases 1676 of the patients (36.2 per cent) did not present axillary metastasis at the time of operation. It was found that 82.1 per cent of these patients were living three years, 72.1 per cent were living five years, 53.8 per cent were living ten years, 42.4 per cent were living fifteen years and 32.6 per cent were living twenty years or more after operation. In cases in which there had been lymphatic involvement the results were less satisfactory. There were 2952 cases in this group or 63.8 per cent of the total. 41.9 per cent of these patients were living three years, 28.0 per cent were living five years, 15.6 per cent were living ten years, 10.1 per cent were living fifteen years and 7.4

per cent were living twenty years following operation.

It is shown by this study the important indications as to prognosis is following surgical treatment are the extent of the malignancy at the time of operation particularly as to the presence or absence of axillary metastasis and the degree of the malignancy as shown by the microscopic examination of the primary malignant lesion.

Davis H H. Factors Influencing the Prognosis in Carcinoma of the Breast. *Ann Surg.* 1938 107 207.

The author has studied 75 cases of carcinoma of the breast that were operated upon between 1915 and 1932. He makes the interesting and significant observation that the private patients came for treatment earlier than the charity patients. Sixteen of 54 private patients were operated upon within one month of their having noted the first symptoms while one half of the charity patients had had symptoms for at least one year before presenting themselves for surgery.

Of the patients surviving at least five years 15 per cent were operated upon within six months of the appearance of signs or symptoms of carcinoma and the remaining 25 per cent were operated upon between six and twelve months after the onset.

The author has devised a new clinical classification of carcinoma of the breast based on (1) the extent of the disease, i.e. whether limited to the breast or attached to the skin or fascia and (2) on the location of the metastasis, if present. He divides the primary tumors into twelve classes and the recurrent tumors into four classes.

While from 40 to 50 per cent of the patients in whom no metastasis occur survive for at least five years, only 18 per cent live five years or longer if only low axillary metastases are present and only 1 patient is now living who had high axillary involvement. In the light of these findings the author raises the question as to the advisability of doing a thorough axillary dissection.

The author presents many tables correlating his clinical classification and the histological classification of Haagensen with the survival of the patients.

FRED O. LATIMER M.D.

White W C. Irradiation as an Aid to Surgical Treatment of Cancer of the Breast. *J. Im. M.* 1935 110 201.

The first result of White's study of irradiation as an aid to the surgical treatment of cancer of the breast has been the recognition of the futility of operation for cure under certain conditions. When a cancer is fixed to the chest wall when the cutaneous area of the thorax is largely invaded en masse or there are nodules over the sternum when the axillary nodes are involved in a bulky mass or when the supraclavicular nodes are invaded the disease has ceased to be a local process and operation is therefore useless except as a palliative measure. A

In certain cases, when extensive primary resections without apicolysis have failed to produce collapse of a cavity, a revision operation will be necessary. In the cases selected by the authors, the cavity had been converted from a round one into a narrow longitudinal slit nestling in the paravertebral gutter alongside the bodies of the upper three or four dorsal vertebrae. Lateral collapse had been sufficient but the cavity was suspended from the apex by ligamentous attachments. In the revision operation, after resection of the regenerated ribs, a line of cleavage was sought in the endothoracic fascia at the level of the third or fourth rib and the lysis carried upward over the apex. In some cases the apicolysis could be accomplished without resecting the first rib. Suture of the divided periosteum and intercostal bundles over the collapsed apex was carried out as in the primary stage of apicolysis. The authors have found that these revision operations are technically next to impossible unless nine to twelve months have elapsed since the primary operation, as this amount of time is required for thorough calcification of the regenerated ribs. The incompletely regenerated bone is so intimately adherent to the periosteum that it cannot be separated from it. The excision of this periosteum sacrifices the only chance for a rigid support for the underlying collapsed lung.

All patients suffered from shock following the operation in spite of every effort to combat it. The first evidence was often noted when the patient was being transferred from the operating table to his bed. Aside from the usual measures, such as application of heat and the administration of fluids intravenously, oxygen was administered in the pharynx for one or two days. Other special features in the postoperative care include the early use of bedside x-ray examinations for evidence of atelectasis, and attention to the tension within the extrafascial cavity. Aspiration of fluid may be necessary and is done through the intact tissues adjacent to the wound.

Waters is quoted by the authors as being of the opinion that no one anesthetic agent or technique solves the problem for all patients and all surgeons or anesthetists. In the authors' experience, moderate pre-operative medication with morphine and scopolamine, followed by quiet induction of anesthesia by inhalation has seldom resulted in disturbances of the respiration. The use of the carbon-dioxide absorption technique has proved desirable. The maintenance of a patent airway is of great importance and can usually be accomplished by means of a pharyngeal airway. An atmosphere simulating the oxygen content of room air as closely as is consistent with adequate oxygenation of the tissues and the blood has been used. When a higher oxygen tension has been used, a false sense of security has been obtained during the operation and has been followed by difficulties in the immediate postoperative period.

Extrafascial apicolysis was performed by the authors upon 65 patients during the interval be-

tween January, 1936, and July, 1937. An additional series of 8 patients underwent revision operations with extrafascial apicolysis. Except for one, only patients having apical cavities were subjected to apicolysis.

Certain clinical, laboratory, and x-ray findings were found to be of some prognostic value. These were correlated with the nature of the postoperative convalescence, which was termed easy, moderately severe, or stormy.

Infection of the wounds was present in a rather high percentage of the cases (11.4 per cent). The incidence was much higher in the drained cases (19.6 per cent) than in those not drained (5.9 per cent). Another important factor was the presence of upper respiratory-tract infections among the operating room staff during the first part of the period covered by the study.

A striking relationship was noted between post-operative atelectasis and pre-operative paralysis of the diaphragm. Of 35 patients in whom mobility of the diaphragm was definitely known to be present, the occurrence of atelectasis was almost twice as frequent as in those whose diaphragms had been paralyzed. The first symptoms usually occurred on the third or fourth day. If uncomplicated by a spread of the tuberculosis, the atelectasis gradually cleared up over a period of from two to three weeks. Although the complication occurred more frequently in patients who had had their diaphragms paralyzed previously, it also occurred in 26.5 per cent of those in whom the diaphragm had normal pre-operative mobility. In addition to the probable factors of bronchial stenosis and aspiration of tenacious material, the weakening of the chest wall with paradoxical breathing resulting from the extensive rib resection is of obvious importance. The cause of the greater frequency of this complication after apicolysis than after an ordinary first-stage thoracoplasty cannot be explained at present. The authors believe that this complication accounts for many of the cases of stormy convalescence, thought to be due to auto-tuberculinization, spread of the tuberculous process, or to tuberculous pneumonia.

A vital capacity of less than 35 per cent of the normal was found to be significant of a dangerously low respiratory reserve, and apicolysis in such patients was followed by a moderately stormy or stormy convalescence in 55 per cent of the cases. Only 20 per cent of those with a higher vital capacity had a stormy convalescence.

The slower the sedimentation rate is, the smoother the convalescence. A smooth convalescence was also noted when the white blood cell differential showed less than 70 per cent of polymorphonuclears and more than 20 per cent of lymphocytes.

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Cavity closure was accomplished in 88.7 per cent of the completed cases, and a negative sputum was also obtained in 80 per cent.

tangentially from two fields and at least 4000 roentgens are given fractionally. Metastases of glands or bones are also irradiated. The histological findings give a general impression but nothing else. The more differentiated cancers permit a better prognosis. If the tumor is benign, it is removed without biopsy and then irradiation is given.

Paget's disease of the nipple takes two courses. The first is fairly benign; there are no metastases, and the condition responds to irradiation. The second course is just the opposite of the first. In general, therefore, combined surgical and irradiation treatment is recommended, and from 80 to 100 per cent of the patients are saved. (HALL) B. KRIVSKY

Pfahler G. E. and Vastrine J. H. Carcinoma of the Breast. The Value of Pre-operative and Postoperative Irradiation. *J. Am. M. Ass.* 1938 110 543

Reviews of records from clinics in different parts of the world and a postoperative study of their own 400 cases of carcinoma of the breast convinced the authors that postoperative prophylactic irradiation is of definite value. These cases belonged to the second clinical stage and were treated and operated on more than five years ago. Pre-operative irradiation is probably of equal or greater importance than postoperative irradiation. The former should be employed within approximately two weeks before operation in cases of carcinoma of the breast in the second clinical stage. Carcinoma of doubtful operability and carcinoma in the third stage are treated over a much longer period of time.

Statistics compiled from the same clinics in which both forms of treatment were used show an improvement of from 11 per cent to 73 per cent when postoperative irradiation was combined with operation as compared with operation alone, according to different authors. Large collections of cases from the literature show an improvement amounting to 25 per cent.

In a group of the best surgical clinics the average number of persons with carcinoma in the second stage who survived when treated by operation alone was 28 per cent, while the general average for postoperative irradiation was 40 per cent. The authors' results with postoperative irradiation of carcinoma in the second stage showed a survival rate of 52 per cent, and when the cases in which pre-operative irradiation was used are included the rate was 57 per cent.

The authors have treated 493 patients who had postoperative recurrence. Of those who had local recurrence 39.7 per cent were well five years. Of those who had axillary or supraclavicular recurrence 23.3 per cent were well five years. Of those with distant metastases 5.1 per cent were free from symptoms for five years and 18.5 per cent of all the patients with recurrence and metastasis regardless of location were alive and free from symptoms for five years after first coming under the authors' care. JOSEPH K. NARAYAN M.D.

TRACHEA LUNGS AND PLEURA

Gale J. W. and Midelfart P. A. Extrafascial Apicolysis (Semb). *Surgey* 1938 3 234

Because of failures in attempting to collapse certain apical rigid walled cavities by means of the usual thoracoplastic procedures, Gale and Midelfart began in January 1936, to use the extrafascial apicolysis of Semb. This paper is concerned with the problems encountered in 65 primary cases and 8 revision operations.

The authors have modified the technique of Semb in several particulars. They resect the first rib entirely before dividing the anterior scalenus muscle above the periosteum, as they believe that this is a safer and easier method. The extrafascial separation is started from the apex as a rule, but when a pleuritis makes this difficult it is started at the level of the third or fourth transverse process and carried upward. The extent of the apicolysis is determined by the pre-operative condition of the patient, the location and nature of the underlying pathology, the amount of paradoxical breathing, the reaction of the patient to the anesthetic and the extent of the rib resection. Usually the pleural cupola is merely uncapped and the anterior segments of the second, third and fourth ribs are left as supports for the anterior portion of the lung. At a later second stage these anterior segments are removed to add to the lateral collapse. Because it was noted that there was a definite tendency for the apex to rise an inter space or more during the first four weeks after operation a new step was added. This consists in suturing together the posterior ends of the divided periosteum and intercostal bundles and fastening them down over the depressed apex to the neck of the next intact rib. In this way paradoxical movement of the apex is prevented and the tendency of the apex to rise is combated. The wound is then closed in layers without drainage.

At the second stage operation, which should never be done in less than three weeks and preferably after four, no effort is made to inspect the apex. Care is taken not to open into the extrafascial cavity. However, if the apicolysis is to be increased at this stage, one must evacuate the cavity and divide the intercostal bundle and periosteum of the first intact rib. The extent of the rib resection will depend upon the nature and location of the lesion, the reaction of the patient to the first stage, his vital capacity, blood picture and blood sedimentation rate. An effort is made to remove enough ribs posteriorly to allow the scapula to fall into the dead space, but this may at times have to be postponed until later.

In some of the cases with large stiff walled cavities in the upper lobe the authors find it necessary to remove all of the anterior segments of the upper four or five ribs to secure the maximum collapse through the use of external pressure. They are convinced that the proper use of shot bags and pressure pads is essential in some cases. This anterolateral operation is carried out as a third stage.

In certain cases, when extensive primary resections without apicolysis have failed to produce collapse of a cavity, a revision operation will be necessary. In the cases selected by the authors, the cavity had been converted from a round one into a narrow longitudinal slit nestling in the paravertebral gutter alongside the bodies of the upper three or four dorsal vertebrae. Lateral collapse had been sufficient but the cavity was suspended from the apex by ligamentous attachments. In the revision operation, after resection of the regenerated ribs, a line of cleavage was sought in the endothoracic fascia at the level of the third or fourth rib and the lysis carried upward over the apex. In some cases the apicolysis could be accomplished without resecting the first rib. Suture of the divided periosteum and intercostal bundles over the collapsed apex was carried out as in the primary stage of apicolysis. The authors have found that these revision operations are technically next to impossible unless nine to twelve months have elapsed since the primary operation, as this amount of time is required for thorough calcification of the regenerated ribs. The incompletely regenerated bone is so intimately adherent to the periosteum that it cannot be separated from it. The excision of this periosteum sacrifices the only chance for a rigid support for the underlying collapsed lung.

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RICHARD H. MEADE, JR. M.D.

Lander F. P. L. and Davidson M. The Etiology of Bronchiectasis with Special Reference to Pulmonary Atelectasis. *Brit J Radiol* 1938 11: 65

By bronchography in appropriate cases in the human subject and by experimental work on animals it was shown that massive collapse of the lung is a necessary and invariable antecedent to bronchial dilatation. Dilatation of the bronchi in a collapsed lung occurs not merely because the lung shrinks in size but because of alterations in the intrathoracic pressure resulting from the shrinkage.

The traditional view that infection is primarily responsible for the production of bronchiectasis is no longer tenable. In the absence of infection bronchiectasis per se is a benign condition.

CHARLES BARON M.D.

Churchill F. D. Bronchiectasis: Its Physical and Physiological Manifestations. *New England J Med* 1938 318: 97

The author reports on a series of 84 cases of bronchiectasis in which lobectomy was performed with a mortality rate of 4.7 per cent. All of the patients who survived were greatly helped and about 85 per cent were completely cured.

In bronchiectasis a productive cough with profuse foul sputum is usually the presenting symptom. This may in itself cause distress and inconvenience to the patient and almost invariably renders him sensitive to its effects on others. He becomes reluctant to appear anywhere at social gatherings. Coughing may induce a spell of coughing the time of emptying is difficult to calculate accurately, and the patient is frequently acutely embarrassed.

The result is a sensitive individual who shuns social contacts and becomes increasingly shy and solitary.

Bronchiectasis is further characterized by acute pneumonic episodes initiated by respiratory infection. Between acute attacks the smoldering infection in the lung gives rise to a sense of fatigue that is insidious and vicious in its effects. This lack of physical endurance paralyzes plans and ambitions for a future career. If the symptoms are at all severe the patient early becomes aware of the impossibility of getting married. The menstrual cycle is frequently disturbed by the chronic invalidism and young women with this disease usually consider themselves unfit to bear children.

It is particularly important that bronchiectasis be recognized and adequately treated early in life, in this way serious psychological difficulties and personality changes may be avoided. Patients between the ages of five and twelve years stand lobectomy well. Young adults should be operated upon before they assume the social responsibilities of marriage or before the door to a happy marriage is closed to them by their illness.

The author's experience has shown him that an established bronchiectasis is not a self-limited disease, but a persistent and often progressive malady constituting even in its milder forms a serious physical and psychological handicap to the patient and eventually terminating in death. While the more conservative remedies and operations may in certain instances bring gratifying symptomatic relief, there is no real cure for bronchiectasis but extirpation of the diseased segment of lung.

J. DANIEL WILLEMS M.D.

HEART AND PERICARDIUM

Danielopolu D. The Method of Indirect Anesthesia. The Methods of Direct Anesthesia and Surgical Methods in the Treatment of Angina Pectoris. (La méthode d'anesthésie indirecte les méthodes d'anesthésie directe et les méthodes chirurgicales proprement dites). *J de chir* 1938 51: 1

In 1923 Danielopolu described a method of treatment of angina pectoris and the gastric crises of tabes with what he terms indirect anesthesia. This method depends upon the fact that pain in these conditions involves two sensory neurones: a vegetative and a somatic neurone which are connected in the spinal ganglion and it is thus possible to arrest the pain sensation by anesthetization of the nerve fibers entering the somatic neurone at some distance from the *rami communicantes* without directly touching the vegetative or visceral neurone. In angina pectoris this may be done by the injection of novocaine into spinal nerves in the second and third dorsal region on the left side or the injection of alcohol into the second to the fourth intercostal nerves on this side. The introduction of alcohol into an intercostal nerve has been found to cause atrophy of the cells of the somatic neurone in the spinal ganglion.

gion The injection of alcohol into the intercostal nerve is made at a considerable distance from the rami communicantes, 6 to 8 cm from the median line The author has used both of these methods in the treatment of angina pectoris, the injection of alcohol gives more lasting results

Other methods for direct anesthetization of the vegetative nerve centers have been proposed in the treatment of angina pectoris These include the anesthetization of the stellate ganglion (Leriche) or of the rami communicantes (second to the fourth dorsal), with either novocaine (Koenig) or alcohol (Swetlow, White, and others) for injection Both of these methods have essentially the same results They both act directly upon the sensory vegetative or visceral neurone The objection to these methods is that either one may interrupt the cardio-accelerator or coronary vasodilator fibers, which is dangerous, because of the effect on the cardiac function

Danielopolu favors operation in the treatment of angina pectoris if the condition of the myocardium or some complicating disease is not a definite contraindication to operation The patient should be prepared for operation by absolute bed rest and by treatment with digitalis combined with small doses of luminal as a sedative If attacks of angina recur frequently, the injection of novocaine into the second to the fourth intercostal nerves is indicated, at about 8 cm from the median line

The author's method of operation is to suppress the pressure reflex, which involves cervical sympathectomy not including the inferior cervical ganglion, but with section of all the branches of the cervical vagus which extend vertically to enter the thorax, section of the rami communicantes which connect the inferior cervical and the first thoracic ganglion with the sixth, seventh, and eighth cervical pairs and the first dorsal branches, and section of the nerve fibers uniting the superior laryngeal nerve to the trunk of the vagus, if any are present This operation may be done in two stages The first stage includes section of the cervical sympathetic chain above the inferior cervical ganglion, of the fibers descending parallel to the sympathetic chain, and of the rami communicantes The second stage consists of resection of the remainder of the cervical sympathetic, not including the inferior cervical ganglion and of the fibers of the vagus passing down into the thorax not resected in the first stage In some cases the first-stage operation gives relief, in 17 cases in which only this stage was done, good results were obtained in 11 cases and moderately good results in 2 others

The author reviewed the cases operated by his method in 1931, and in this article adds 11 additional cases Cure or definite improvement was obtained in over 70 per cent This includes 28 cases relieved of angina for over a year The author finds these results better than those reported for the operation of resection of the stellate ganglion (Leriche) The latter involves the same dangers as anesthetization of the stellate ganglion

ALICE M MEYERS

Davies, D T., Mansell, H E., and O'Shaughnessy, L.: Surgical Treatment of Angina Pectoris and Allied Conditions *Lancet*, 1938, 234 1, 76

When we consider the appalling mortality from coronary disease we must hail with interest the researches and experiences of a group of English surgeons who have initiated a surgical treatment for angina pectoris and allied conditions It is now pretty generally conceded that the great underlying cause for coronary disease is cardiac ischemia There are several types of cardiac ischemia The one major catastrophe which seems imminent in most cases of coronary disease is coronary thrombosis Under some conditions this coronary occlusion is a fatal event. It sometimes happens, however, that a block of the circuit is survived Occasionally even successive attacks of coronary thrombosis may be survived because of the remarkable degree of natural compensation present in some instances

Experimental and clinical evidence emphasizes the two methods nature employs to augment the blood supply to the heart One of these methods is anastomosis between the right and left coronary arteries The other is the process by which the heart may supplement its blood supply from the parietes Evidently the first means is of no avail when a diffuse sclerosis affects the entire coronary tree The second is available only if partial or complete destruction of the epicardium takes place so that adhesions may form between the heart and the parietal pericardium Only a small proportion of patients present adhesions between the infarct and the parietal pericardium after a coronary thrombosis This latter method, however, is important because it alone can be initiated or supplemented by surgery

For a number of years experimental work on various methods of augmenting the blood supply to the heart has been in progress by the Royal College of Surgeons of England Animal experiments showed conclusively that an omental graft attached to the heart is compatible with the highest degree of physical exertion Moreover, it was demonstrated that vascular connections rapidly form between the graft and the myocardium, whether it is attached to normal muscle, to the site of a recent infarct, or to the site of an old fibrous infarct, this is important because these are the three conditions with which one might be confronted at operation Within a remarkably short time the process of revascularization is established New vessels may be observed microscopically at the end of a week It is a fundamental point that cardio-omentopexy brings a new blood supply to the heart from the abdominal aorta and also supplements the normal collaterals in the mediastinum, giving them access to the ischemic heart Moreover, the graft forms direct connections with the myocardium at its point of attachment and its vessels anastomose with branches of the coronary tree In this way blood brought by the graft may be distributed to all parts of the heart

Later experiments have shown that the lung can form extensive vascular adhesions with the heart

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tal, Nashville, and 2 from the Peter Bent Brigham Hospital, Boston

The most common complaints of patients with constrictive pericarditis are dyspnea on exertion, swelling of the abdomen, weakness, cough, edema of the feet and ankles, and discomfort in the upper part of the abdomen. The most impressive physical signs are those of systemic congestion—namely, prominent veins, elevated venous pressure, enlarged liver, ascites, and peripheral edema. Pulmonary edema is rare, but pleural effusion is frequently present. These signs may remain unchanged for months or even years. They point strongly to failure of the right side of the heart and they are combined with a normal or slightly increased area of cardiac dullness, a fixed heart with diminished pulsations, distant heart sounds, and an absence of visible or palpable apex beat. There are usually tachycardia and regular rhythm without murmurs. The pulse rate is usually paradoxical and the pulse pressure is small. The combination of a marked degree of peripheral congestion and a small quiet heart is the most important point in the recognition of the condition.

The alterations in the circulation include (1) elevation of the systemic venous pressure, (2) a low systolic arterial pressure and a small pulse pressure, (3) tachycardia at rest, (4) a diminution in the pulsation of the heart, (5) a decrease in the velocity of the blood stream, (6) an increase in the total blood volume, and (7) a decrease in the output of the heart.

J DANIEL WILLEMS, M D

ESOPHAGUS AND MEDIASTINUM

Edwards, J. G.: Malignant Disease of the Esophagus. *Med J Australia*, 1937, 2 987

Several important facts are brought out in the author's description of methods which he employs in establishing the diagnosis of carcinoma of the esophagus. He very properly calls attention to the great danger of perforation with blind bougienage. A fact so often overlooked and which he emphasizes is the necessity for getting the eyes accustomed to seeing in the dark before the screening is done. He calls attention to the advantage of placing the patient in the left posterior oblique rather than in the right anterior oblique position for screening. In this position the right shoulder is placed against the stand and the screen posterior to the left scapula. Also, in certain cases, it is of value to make the examination with the patient's head lower than his feet in order to slow down the swallowing process. The author differentiates between the appearance of the stricture in malignant disease and in other conditions, and calls attention to the value of the history of injury and duration of the disease, as well as of the ragged outline seen only in malignant disease. Furthermore, he states that in malignant disease symptoms are noticed earlier when the lesion is high up than when it is in the lower portion of the esophagus, especially when it is associated with regurgitation and overflow into the larynx. In

lesions lower down there is greater dilatation than in those high up. In cardiac achalasia the esophageal dilatation is greater than in malignant disease. Also, in achalasia the meal may be held up for a time and then suddenly allowed to pass through the stricture, or it may be suddenly returned. This is said not to occur in malignant disease.

At times the complications due to a bronchial or tracheal fistula may be the first indication of malignant growth of the esophagus. The author calls attention to the necessity for differentiation between malignancy and transdiaphragmatic hernia of the stomach and to the value of fluoroscopy as an aid in placing radium needles in position. He states that two methods of study are valuable in the diagnosis of carcinoma of the esophagus, fluoroscopy and examination by means of roentgenograms followed by esophagoscopy. MILLARD F ARBUCKLE, M D

Brunn, H., and Stephens, H. B.: Carcinoma of the Thoracic Esophagus. *J Thoracic Surg*, 1937, 7 38

The authors first present a short discussion of the status of surgical treatment of carcinoma of the esophagus in which they set forth many of the disadvantages and dangers attendant upon this and all other methods of treating such cases. They refer to Torek's case in 1913 and reports of numerous other surgeons. They call attention to the fact that nearly all cases were seen late in the course of the disease, when the patient was already beyond the stage of operability.

The authors also refer to their experience with roentgen-ray treatment and the combination of deep roentgen therapy and the intra-esophageal application of radium, as suggested by Crump and Kasabach. They emphasize the importance of pressure relations within the thorax to the successful outcome of any major intrathoracic operation. They stress the value of preliminary pneumothorax as a means of stabilizing the mediastinum during and after the operation, also, the value of positive pressure intratracheal anesthesia during intrathoracic operations.

They then report a case of successful resection of cancer of the esophagus in a Mexican woman, aged fifty-four years. In this case avertin was given in a seemingly rather large dose, 100 mgm of avertin per kilo, plus gas and oxygen. The approach to the tumor was first transthoracic by the posterior route for exposure and elevation of the lesion from the aorta and surrounding tissues and division of the esophagus below the tumor. Then, through an incision of the left side of the neck along the anterior border of the sternocleidomastoid muscle, the superior mediastinum was exposed. The freed esophagus was pulled up through the neck incision. The tumor was then excised and the distal end of the upper esophagus anchored to the skin of the chest wall by interrupted silk sutures. The tumor had involved the lower surface of the arch of the aorta from where it was necessary to dissect it. A few hard discrete lymph nodes attached to the tumor

when the fibrous pericardium is removed. In the most recent experiments it was shown that by the use of a special preparation aleuronat, intrapericardial adhesions could be produced; this provides an additional and simple means of revascularization. In this way a means of revascularization from the mediastinal vessels is provided but the method is inferior to cardio-omentalopexy in that reinforcement of these vessels does not occur.

In the earlier experiments and operations the omental graft was always sutured to the heart. More recently equally firm attachment of the graft was obtained by suturing it to the pericardium only and applying aleuronat paste between the graft and the heart. It was demonstrated that the vascular continuity under these conditions was of the same order as when sutures were employed. Technically this is important, since experience has shown the danger of placing sutures in a friable and degenerate heart.

The authors report their results with the surgical treatment of 30 cases of cardiac ischemia. Only such patients were selected for operation who showed unequivocal evidence of cardiac ischemia and who had failed to benefit by medical treatment. The majority of the 30 patients were suffering from angina pectoris. In every instance the operative aim was to supplement the coronary circulation from without. The actual technique was modified to suit the individual case and varied from complete cardio-omentalopexy to simple pericardiectomy for insertion of the irritant aleuronat to encourage pericardial adhesions.

The cases are considered in two groups. In the first group were 15 patients suffering from angina pectoris, and in the second group were 5 patients suffering from other symptoms of cardiac ischemia. Of the first group 5 died while 8 of the remaining 10 are free of angina. In the second group there was 1 death and 1 is free of symptoms.

After a careful review of the first group there can be no doubt that angina pectoris or angina of effort as the authors frequently term it is caused by a defective blood supply to the heart. That the revascularization effected by operation relieved pain contributes new and important evidence of this fact. It is also known however that the most extreme degree of cardiac ischemia may exist without causing pain at all. Often the warning symptom is not pain but shortness of breath on exertion or a feeling of oppression in the chest. There is also the more recent angle to consider, namely the consideration that ischemia is now believed to play a part and possibly the dominant part in that large group of cases formerly labeled chronic myocarditis or myocardial degeneration. These considerations justified the possible benefit of operation on patients of the second group.

The authors have concentrated their efforts on the treatment of the angina group. Angina pectoris is the name given to a syndrome the peculiar feature of which is the possibility of sudden death. Modern research has shown that its cause is defective coronary

circulation. From the first attack there is curtailment of the victim's activity. Prognosis is impossible. The disease progresses inexorably, for the pathological condition underlying it is defective coronary circulation due to changes in the coronary tree which are irreversible and progressive. Therefore medical treatment of this condition has great limitations. The dreaded catastrophe coronary thrombosis follows inevitably in the progress of this disease. Medicine cannot avert it though it may bring alleviation. Much can be achieved by skillful management: avoidance of the factors which precipitate pain (such as emotional stress, undue exertion, heavy meals, or exposure to cold); reduction of the patient's weight and the use of nitrites for individual proxysms. Conceding the value of such measures one must admit that at best they can only alleviate angina and avail not either in attacking its underlying cause or in postponing the catastrophe of coronary thrombosis.

The authors state that their initial attempts at the surgical treatment of cardiac ischemia were undertaken with misgivings. It seemed that an operation might be too severe for the endurance of those in the last stages of angina and too severe for contemplation of those in the earlier stages. However bedridden patients displayed no immediate distress after the full operation of cardio-omentalopexy. Distress did not occur either in the patients or in the greyhounds which were used in the previous experimental work and subsequently subjected to great physical strain after their operation. The authors therefore do not consider it to be a serious danger.

In their selection of patients for operation the authors considered two criteria as essential, namely: (1) unequivocal evidence of cardiac ischemia and (2) fitness for operation. Under the first heading the patient's history and the clinical electrocardiographical and roentgenographical findings are important. Under the second heading age is the first consideration. Generally speaking it seems inadvisable to suggest operation for patients more than sixty-five years of age.

The authors do not claim to prove that surgery offers an unfailing cure for angina, but only to support the original contention that operation is feasible and attended with a low immediate mortality. They realize that for final justification the operation must be shown to have improved the prognosis in a large series of cases of angina. Evidently much work lies ahead. Nevertheless the indisputable experimental and pathological evidence that revascularization of the heart can be induced in man justifies the application of the principle so established to a proportion of that enormous group of patients who are suffering from a deficient blood supply to the heart.

MATHIAS J. SEIFERT, M.D.

Burwell C. S. and Blalock A. Chronic Constrictive Pericarditis. *J. Am. M. Ass.* 1938 110 265

The authors report 21 cases of constrictive pericarditis 19 from the Vanderbilt University Hospital

THE TREATMENT OF ACUTE PANCREATITIS

Collective Review

WARREN H COLE, M D , Chicago, Illinois

SO much confusion exists relative to the classification and identification of the various types of acute pancreatitis that a consideration of treatment must be prefaced with an attempt at identification of these various types and the etiological factors involved

Acute pancreatitis may be divided roughly into acute edematous (38), or interstitial pancreatitis, and acute pancreatic necrosis. It appears very appropriate, as has been recommended by others, to subdivide the latter group into (1) hemorrhagic, (2) necrotic, and (3) suppurative types. A study of the etiological factors involved in acute pancreatitis has led many observers to conclude that although the two major types of the disease, viz., edematous pancreatitis and pancreatic necrosis, are quite different clinically, they are in reality stages in the same disease process. In support of this assumption the experiences of Quick (28), who found extensive pancreatic necrosis at autopsy in a patient who had only an acute edematous pancreatitis at operation two days previously, may be mentioned. Because of this relationship it is obviously appropriate that many features in treatment as well as pathogenesis not be considered separately. It is very probable that obstruction of the pancreatic ducts is the important mechanism in the pathogenesis of acute edematous pancreatitis. A study of 8 cases (5), 6 of which were of the acute edematous type, made by the author shows rather conclusively that the obstruction produced by compression of the pancreatic duct incident to the passage of a stone through the common duct is sufficient to produce enough pancreatitis or edema to bring about a sharp rise in the blood amylase. The fact that examination of biopsy specimens removed at operation reveals so few pathological findings would support the contention that obstruction of the ducts is the major factor in pathogenesis in acute edematous pancreatitis. The theory of reflux of bile as based upon the experiments of Bernard in 1856, and experimental and clinical data presented later by Archibald (2, 3) and Opie (27), would appear to be important etiologically in a few cases, particularly those of the necrotic type.

In addition to the irritation inflicted by the reflux of bile, tryptic digestion is quite certainly a prominent factor in the pathogenesis of hemorrhagic pancreatitis and may cause the chief difference in the pathogenesis of the types of lesions. Although infection is probably a factor in the pathogenesis, it is likely that it exists more often than actual abscess formation in only a small percentage of cases. A theory expressed by Rich (30), that metaplasia of the cells within the duct may produce an obstruction with consequent rupture of the duct and extravasation of the secretion, is an important contribution to the pathogenesis.

All observers agree that gall-bladder disease is a very frequent accompaniment of acute pancreatitis. Dragstedt (9) has estimated that gall-bladder disease is present in at least 60 per cent of patients suffering from acute pancreatitis. In the small series of cases observed by the author, most of which were of the acute edematous type, cholecystic disease was encountered in all. In fact, stones were found in the gall bladder in 7, and in the common duct in 5 of the 8 cases. In a series of 9 cases of acute edematous pancreatitis reported by Quick (28) all the patients had cholelithiasis. The presence of gall-bladder disease, therefore, is of serious importance in the consideration of the treatment of acute pancreatitis. In a survey of the literature the author was able to find the reports of only 3 patients who developed acute pancreatitis as a new entity after cholecystectomy had been performed. However, the relationship of residual pancreatitis and persistent symptoms following cholecystectomy is well known, as has been emphasized by Elman (12, 13, 14) and others.

The two major types differ symptomatically chiefly in that the manifestations are much more severe in acute pancreatic necrosis. Shock may be present in this type, although it is uncommon. Fever is not always present, particularly in the early stage of the disease. Pain is usually severe and located in the epigastrium, and commonly radiates posteriorly. Tenderness is almost invariably prominent over the pancreas itself.

PROPHYLACTIC TREATMENT OF PANCREATITIS

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From the University of Illinois, College of Medicine, Department of Surgery.

were removed with the tumor. The mediastinal pleura was ruptured and repaired. Transfusion was given during the latter stage of the operation. The procedure required altogether four and one half hours and the patient was returned to the ward in remarkably good condition. The postoperative convalescence was comparatively uneventful. Deep roentgen therapy was given for eleven days beginning on the twenty first postoperative day. During a follow up study of eight and one half months the only untoward symptom was shortness of breath which was interpreted as being the result of intensive roentgen therapy. Important factors which are mentioned are the patient's physical condition at the time of operation and her previous state of health.

MILLARD F ARBICKER M.D.

Eggers C. Plastic Reconstruction of the Esophagus. *Ann Surg* 1933 107 30.

The author reports a case of thoracic resection of a stenosed esophagus, which histologically proved to be non malignant. A plastic reconstruction of the esophagus was performed as follows:

Two perpendicular incisions were made 3 in. apart over the left anterior part of the chest. The incisions extended from the esophageal opening to the gastrotomy opening. The skin edges of the 3 in. segment were undermined from each side until they could be sutured in the midline to form a tube. The upper end of the tube extended slightly above the esophageal opening; below it did not quite reach the gastrotomy opening. The skin margins were widely undercut laterally until they could be approximated over the skin tube. Counter incisions in the lower portion released the tension on the flaps.

One month later the esophagus was connected to the skin tube above. The patient refused to permit the lower end of the tube to be connected to the gastrotomy, but devised an angulated tube that connects the skin tube to the stomach quite satisfactorily and needs to be cleaned only once a day. A recent roentgenological examination reveals excellent function.

J ARLO LATIMER M.D.

MISCELLANEOUS

Harrington S W and Kirklin B R. The Clinical and Roentgenological Manifestations and Surgical Treatment of Diaphragmatic Hernia with a Review of 131 Cases. *Radiology* 1933 30 147.

The more frequent recognition of diaphragmatic hernia in recent years may be attributed entirely to the development of roentgenography. A study of proved instances of this condition has established symptoms and has enabled the clinician to suspect a diaphragmatic hernia, but roentgenography is still the most important factor in making a definite diagnosis. Roentgenography is also of great aid in determining the size and situation of the opening and the type of abdominal viscera which has herniated. The symptoms are usually progressive and vary in type and intensity, according to the amount and type of herniated abdominal viscera and the degree of mechanical interference with the normal function of the diaphragm, heart and lungs. The symptoms often resemble those of other organic diseases of the abdomen and thorax, especially cholecystitis, peptic ulcer, cardiac disease, secondary anemia and esophageal obstruction. Operative replacement of the herniated viscera and repair of the abnormal opening in the diaphragm is the only treatment that insures complete relief from the symptoms. The hernial opening is best repaired through an abdominal approach by using fascia lata and interrupted linen sutures. Temporary or permanent interruption of the phrenic nerve is of value as a preliminary procedure to radical closure of large openings and is particularly useful when there is deficiency or loss of structure of the diaphragm.

The surgical procedures and results in 131 cases have been reported. Radical repair of the hernia was carried out in 120 cases. There were 7 operative deaths. Of the 123 patients who recovered from radical operative repair of the hernia 110 were relieved of their symptoms. In the remaining 13, the hernia and symptoms recurred.

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Acute pancreatitis may be divided roughly into acute edematous (38), or interstitial pancreatitis, and acute pancreatic necrosis. It appears very appropriate, as has been recommended by others, to subdivide the latter group into (1) hemorrhagic, (2) necrotic, and (3) suppurative types. A study of the etiological factors involved in acute pancreatitis has led many observers to conclude that although the two major types of the disease, viz., edematous pancreatitis and pancreatic necrosis, are quite different clinically, they are in reality stages in the same disease process. In support of this assumption the experiences of Quick (28), who found extensive pancreatic necrosis at autopsy in a patient who had only an acute edematous pancreatitis at operation two days previously, may be mentioned. Because of this relationship it is obviously appropriate that many features in treatment as well as pathogenesis not be considered separately. It is very probable that obstruction of the pancreatic ducts is the important mechanism in the pathogenesis of acute edematous pancreatitis. A study of 8 cases (5), 6 of which were of the acute edematous type, made by the author shows rather conclusively that the obstruction produced by compression of the pancreatic duct incident to the passage of a stone through the common duct is sufficient to produce enough pancreatitis or edema to bring about a sharp rise in the blood amylase. The fact that examination of biopsy specimens removed at operation reveals so few pathological findings would support the contention that obstruction of the ducts is the major factor in pathogenesis in acute edematous pancreatitis. The theory of reflux of bile as based upon the experiments of Bernard in 1856, and experimental and clinical data presented later by Archibald (2, 3) and Opie (27), would appear to be important etiologically in a few cases, particularly those of the necrotic type

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titis The reports of observers making a study of acute edematous pancreatitis, as well as our own experiences, indicate that gall bladder disease particularly cholelithiasis, is even more common in this type than in acute pancreatic necrosis It is obvious, therefore, that elimination of gall bladder disease would likewise eliminate acute pancreatitis Even though cholecystectomy is very effective in preventing the development of pancreatitis, gall bladder disease is far too common and pancreatitis too uncommon to justify cholecystectomy merely in the endeavor to prevent acute pancreatitis However since pancreatitis is such a severe and serious disease resulting in many instances in irreparable damage to the pancreas, a certain amount of prophylactic surgery should be advisable For example, an attack of pain produced by cholecystitis, but likewise associated with pain and tenderness in the left upper quadrant, and a rise in the serum or urinary amylase, would be a stronger indication for cholecystectomy than an attack consisting of cholecystitis alone In such instances operation on the biliary tract would be advisable even though the attack was not severe but perhaps would not be indicated if cholecystitis alone were the cause of the patient's symptoms

It is generally agreed that acute pancreatitis occurs very commonly about an hour after a full meal has been eaten The disease has always been very common in Germany but is reported to have been very uncommon during the lean post war days (Hagyard 18) Whether or not the institution of more temperance in eating would diminish the incidence of pancreatitis is after all a question subject to debate

ACUTE EDEMATOUS PANCREATITIS

In this type of disease there is very little question regarding the method of treatment The danger of development of serious complications incident to delay is minimal With very few exceptions the process tends to subside It is true however, that symptomatic subsidence takes place long before the resolution of the pathological changes The treatment of choice would be bed rest, administration of morphine, and elimination of oral intake of food As will be discussed later food acts as a stimulus for the pancreas and in that way would tend to produce more edema which might possibly result in more serious changes such as necrosis The patient should then be put on a regime allowing nothing by mouth except perhaps a small amount of water Obviously fluids must be maintained up to 3000 ccm or more per day Glucose administered intra

venously should make up a large part of this fluid It is probable that insulin should be given with the glucose If the patient is seen early in the attack an elevation of the blood or urinary amylase will usually be found To a certain extent the progress of the disease can be determined by the rapidity of the fall in the amylase level After symptoms have subsided, attention should be directed to the possible presence of cholecystitis particularly with the idea of eliminating the disease and thereby eradicating the most likely initial focus Cholecystograms should be taken in an effort to determine whether or not cholecystitis is a significant feature in the disease If cholecystitis, with or without stones is proved to be present the gall bladder should be removed This should be done, however, only after there has been a complete subsidence of symptoms for at least a week following the acute attack Operative therapy should be directed toward the gall bladder and bile ducts without regard to the presence of pancreatitis The common duct should be opened if there are indications such as dilatation and thickening of the wall and any stones present should be removed Many surgeons advise leaving the T tube in the common duct for many months in the presence of pancreatitis The author is inclined not to advise drainage for so long a period but is of the opinion that after three or four weeks the tube can usually be removed safely The presence of jaundice is of course, a strong indication for the exploration of the common duct and for the usage of a T tube over a longer period of time Obviously the tube should not be removed while jaundice is still present It can be clamped an increasing amount each day after a couple of weeks and the time of removal determined in this way In a case observed by the author (Fig 1) the patient remained jaundiced for several weeks in spite of the fact that a stone had been removed from the common duct and a choledochogram indicated that no more were present After six weeks however the jaundice cleared and the tube was removed without further trouble It is our opinion that cholecystostomy should not be performed except when cholecystectomy appears to be too formidable In the small series observed by the author 2 cases represented recurrent pancreatitis following cholecystostomy Some surgeons are reluctant to remove the gall bladder in the presence of pancreatitis because of its possible use in cholecystoduodenostomy to shunt bile around a pancreatic obstruction created by a previous attack of pancreatitis The tendency of pancreatitis to recur when only cholecystostomy is performed

would appear to overrule the contention that the gall bladder should be saved for that reason Jones (19) has remarked that in 2,500 patients with cholelithiasis and cholecystitis, he has never had occasion to perform anastomosis between the gall bladder and the pylorus or duodenum because of pancreatitis in the absence of carcinoma

ACUTE PANCREATIC NECROSIS

In this type of lesion, there is a total lack of agreement as to whether operative or conservative treatment should be employed. Many years ago immediate operation was the treatment advised in practically all cases. During recent years, as will be discussed later, more surgeons are advising conservative therapy, with operation on the biliary tract later as indicated, instead of immediate operation.

Unfortunately, the diagnosis of acute pancreatic necrosis may be suspected, but not always diagnosed with certainty. The time required to perform an amylase test (two or three hours) to a certain extent decreases the aid which this test might offer, if the surgeon is considering immediate operation as his treatment of choice. The uncertainty of diagnosis, being caused particularly by the inability to exclude perforation of a peptic ulcer or a viscus such as the gall bladder, may then compel the surgeon to operate and not allow him to choose between radical versus conservative measures. However, it is a significant fact that during recent years a large number of workers (Elman, 12, 13, 14, Wildgans, 36, Mushin, 25, Foged, 15, Boshamer, 4, Guleke, 17, McCaughan, 22, and others) have stated that amylase determinations (blood or urine) have yielded results of inestimable value in the diagnosis of acute pancreatitis. For example, Mushin reports 25 consecutive confirmed cases of acute pancreatitis in which the urinary amylase was sharply elevated. In his series of 140 cases with a normal level of urinary diastase, operation or autopsy confirmed the absence of pancreatic involvement. It must be remembered, however, that after the first two or three days of the disease the *amylase level will usually, but not always, drop back to normal or sub-normal*. The test is about equally effective in the two major types of pancreatitis. The fact that practically all observers who have reported their experiences with the amylase test find it of great diagnostic value suggests that it could be used to advantage in all clinics where acute pancreatitis is common, particularly if a conservative attitude is taken in its treatment.

There will be a small group of patients critically ill whose cardiovascular depression is so acute



Fig 1. Choleldochogram of patient four weeks after removal of a stone from the common duct. The patient was still deeply jaundiced. It was feared that a stone was left in the common duct and was the cause of the obstruction. The roentgenogram noted above, however, shows rather conclusively that the funnel-shaped narrowing at the end of the common duct is probably produced by pancreatitis and not by a stone. Subsequent evidence proved this point, because the jaundice finally began to clear, and had totally disappeared seven weeks after operation. The T tube was then removed a few weeks subsequently, and the patient recovered without any residual symptoms.

that an operation will obviously be contra-indicated. Wildgans has called attention also to the value of utilizing the blood-sugar level in estimating the prognosis. He noted that patients with a blood sugar elevated much above 300 were so ill that a fatal outcome might result, regardless of the type of therapy used.

Emergency operative treatment. Numerous types of operative procedures have been resorted to as emergency measures in the treatment of acute pancreatic necrosis. Obviously, if the patient is in shock, adequate therapy, including the administration of saline and glucose, and supplemented perhaps with a transfusion, must first be given. The merits and demerits of the various operative procedures will be discussed in greater detail later.

1. Perhaps the procedure performed most commonly is *drainage of the pancreas*. Some surgeons are content to split the peritoneum overlying

the gland and insert gauze or soft rubber drains down to the area. Other surgeons actually split the gland longitudinally hoping to encourage drainage of necrotic material to the exterior.

2 *Drainage of the lesser peritoneal sac* is occasionally recommended to prevent the accumulation of toxic products with subsequent absorption and likewise to prevent the development of a pseudocyst. This drainage may be achieved through either the gastrohepatic or gastrocolic omentum.

3 *Cholecystostomy* is perhaps a safer procedure for establishing drainage or decompression of the biliary tract than either of the two following types of operation mentioned. It is certainly less shocking to the patient. With very few exceptions decompression of the biliary tract can be achieved with cholecystostomy. The greatest defect associated with this procedure is the fact that pancreatitis is very apt to recur as is noted by numerous observers in the medical literature. Cholecystitis, if present at the time of operation is also likely to recur.

4 *Choledochostomy* will obviously be slightly more efficient than cholecystostomy in effecting biliary decompression, but is more shocking to the patient. Jaundice stones in the common duct and dilatation of the common duct constitute indications for drainage of the common duct. Since choledochostomy is so much more effective in the alleviation of the pancreatitis as well as of the biliary obstruction many surgeons resort to this procedure in most of their emergency operations when the above indications are present.

5 *Cholecystectomy*, an important procedure in the complete subsidence of acute pancreatitis when cholecystitis is present, is advised by many, but obviously may be too shocking particularly if a choledochostomy is to be done also.

Conservative treatment. Obviously this kind of therapy can be considered only in those cases of the disease in which perforation of a viscus can be eliminated. The presence of jaundice might also be considered a contra indication for the adoption of conservative measures since biliary decompression would obviously be indicated more strongly in this group of cases. Of the conservative measures bed rest and the administration of narcotics are of course essential. The ingestion of food by mouth is contra indicated because of the rather definite proof of the relationship of food to the activation of trypsin within the pancreas. Howland (31) has emphasized further that the removal of gastric contents by the insertion of a suction tube may be of value and put the pancreas at more complete rest. Theoretically glu-

cose given intravenously should perhaps be 'covered' by insulin in the hope that the pancreas will be put at rest to a still greater degree. While the acute process is subsiding the patient is treated symptomatically. However, the persistence of fever or its development along with other signs of an infectious process in the abdomen might make it necessary to abandon conservative treatment in favor of operation at any time on the basis of the probable development of an abscess associated with the pancreatitis. As the acute process subsides, food is allowed in gradually increasing amounts. It is not uncommon for the pancreatitis to subside completely within a few days after onset. However, the frequency of recurrence in patients who have an associated gall bladder disease makes it desirable that a cholecystogram be made with the idea of resorting to surgical treatment of the gall bladder or bile ducts at a later date. The type of operative procedure indicated after the acute symptoms have subsided will be quite identical to that discussed under acute edematous pancreatitis.

COMPARATIVE VALUE OF OPERATIVE VERSUS CONSERVATIVE TREATMENT

As stated previously there is no agreement as to whether conservative or operative treatment should be recommended for acute pancreatic necrosis. Up until a few years ago the great majority of surgeons advocated immediate operation. Recently however the majority of surgeons who have made a study of the situation are in favor of conservative treatment at first but recommend operation on the biliary tract later as indicated. The fact that there is no uniformity in the types of operative procedures performed would suggest that the value of operation might be overemphasized although it is undoubtedly true that different procedures would be indicated in different cases. It is very significant that authorities such as Korte (1), Abell (1), Eggers (10), Wolfer (37), McWhorter (3), Jones (19) and others recommend immediate operation whereas authorities including Wangenstein (34), Nordmann (26), Hagyard (18), Smead (32), Lewis (21), Mikkelsen (24), Walzel (33), Demel (6), Rapant (29), De Takats and Mackenzie (7) and others recommend conservative treatment followed perhaps by operation later. After all this gross difference in opinions may mean that neither method is significantly superior to the other. Gatewood (16) favors early operation to a slight extent but remarks that incision of the capsule of the gland is not advisable because of the danger of increasing the hemorrhage. Eliason and North (11) like-

wise are inclined to believe in early operation, but after a review of the mortality statistics following operation in their series of cases, they remark, "The accepted mode of treatment by emergency laparotomy may not be the best one" McWhorter (23) concluded that early operation is the procedure of choice but remarks that the lowest mortality (22 per cent) in the groups studied by him occurred in a group of 9 cases in which operation was performed two weeks after the onset of the disease

The fact that the pancreas lies in somewhat loose areolar tissue near vital structures such as important nerve plexuses may be one of the reasons that the disease produces such a profound reaction in the severe cases. Part of the value of operation lies in drainage of the supposedly toxic fluid produced by the necrosis of the gland itself. Archibald (2, 3), who in reality was in favor of early operation, remarked that he could scarcely understand how operative procedures could significantly decrease the absorption of the toxic products. Eggers (10) believes that one of the most important features of the operation lies in the prevention of absorption of the toxic fluid formed, by sponging it out at operation and encouraging its escape after operation by means of drains. On the other hand, while discussing the toxicity of this peritoneal fluid, Smead (32) remarks, "These toxic substances are so diluted and neutralized by blood and peritoneal exudate that they are no longer harmful and need not be removed"

It must be remembered that the type of operation indicated as an emergency measure may differ considerably from the operation performed at a later date after the acute symptoms have subsided. In general, the purpose of the emergency operation is to drain the pancreas and decompress the biliary system, whereas in the operation performed after subsidence of the symptoms the purpose is to eliminate the factor (usually the gall bladder or common duct) producing the pancreatitis

Many observers who believe in emergency operation believe that incision of the overlying tissue with liberation of the toxic material is the most important procedure in the operation. However, Smead has very appropriately called attention to the fact that the anatomical arrangement of the pancreas into lobules would prevent drainage of the organ unless each individual lobule were split, a procedure obviously impossible. Lewis (21) goes still further in condemnation of operative procedures on the pancreas itself and concludes, "handling of the pancreas in the early stages is

to no good purpose. It is even harmful, for the limits of the diseased process cannot be determined macroscopically and the demarcating walls established by nature may be destroyed by rough handling." Another danger incident to incision into the pancreas lies in the possibility of incitation to hemorrhage, as pointed out by Walzel (33), who reports a fatal hemorrhage from the splenic vein following an incision into the gland

As mentioned previously, the emergency operative procedures related to the biliary tract consist of (1) cholecystectomy, which eliminates the primary lesion instigating the pancreatitis, (2) choledochostomy, and (3) cholecystostomy, the latter two serving to decompress the biliary system. It is agreed by all who advise immediate operation that such procedures can be done only if the patient's condition will permit. In view of the importance of gall-bladder disease in the pathogenesis of acute pancreatitis, eradication of the primary factor would obviously be a very desirable feature from the standpoint of curing the disease. The same statements can be made regarding stones in the common duct and choledochostomy, particularly if jaundice is present. Decompression of the common duct primarily to prevent reflux of the bile into the pancreatic duct is advised by a few, but as intimated previously, the supposition that pancreatitis is caused by reflux of bile in only a small percentage of cases has been generally agreed upon in recent years. Moreover, if reflux of the bile were the primary factor in the production of the pancreatitis, it is probable that the duct of Wirsung would be blocked early in the disease and further reflux of the bile would be impossible. Recovery would in reality depend largely upon the ease of development of anastomatic channels into the duct of Santorini, which development, Opie thinks, can readily take place in the majority of people. Drainage of the common duct in the absence of stones, jaundice, and dilatation or thickening of the duct would then scarcely appear to be so necessary. Unless the cystic duct is obstructed, decompression of the biliary system can be achieved by cholecystostomy, a procedure far less shocking to the patient and one which would tend to eliminate, for the time being, the adverse influence of the cholecystitis on the pancreatitis. As a general rule, it is then perhaps safer to attain decompression by cholecystostomy, and leave choledochostomy for occasional use during the acute stage of the disease

The average mortality in acute pancreatic necrosis, regardless of the type of therapy used, is about 50 per cent. On account of the indefinite

attempts in the literature to separate acute edematous pancreatitis from acute pancreatic necrosis it is difficult to ascertain the mortality of acute edematous pancreatitis but it is quite certainly less than 10 per cent. Of 6 patients observed by the author, all of whom were treated by delayed operation, none died. The mortality figures of acute pancreatic necrosis vary so much in the various reports that it is extremely difficult to use them in determining whether immediate operation or conservative treatment is the treatment of choice. From the standpoint of statistics however the latter treatment appears to be associated with a higher percentage of survivals. A recent report by Mikkelsen (24) who treated 39 cases conservatively with operation on the biliary tract from one to three weeks after subsidence of the acute symptoms appears to offer strong arguments in favor of conservative treatment. The mortality in this group of patients 20 of whom were acutely ill was only 7½ per cent. Results published by Demel (6) likewise support conservative therapy. During the period between 1926 and 1934, the mortality in a group of 22 cases 93 per cent of which were operated on as emergencies was 78.3 per cent. Between 1934 and 1936 Demel reported a series of 34 cases, only 50 per cent of which were operated on as emergencies with a mortality of only 26.4 per cent. For the most part he operated on only those patients in whom the differentiation between acute pancreatitis and ruptured ulcer was impossible. A sharp reduction in the mortality by adhering to similar principles is likewise reported by Rapant (29). He resorts to early operation (1) when the diagnosis is not clear (2) when clinical signs of peritonitis are definite (3) if ileus is present for thirty six hours without improvement and (4) when signs point rather definitely to the presence of an abscess about the pancreas. He advises against operation (1) when the diagnosis of acute pancreatitis is quite certain (2) when peritonitis is present along with signs of renal damage and failing circulation (3) in mild cases and (4) as long as signs of the inflammatory process appear to be arising primarily from a retroperitoneal process. As stated previously, reports may like wise be found in which better results appear to have been obtained by immediate operation, but the favorable results of conservatism appear definitely to overbalance those of immediate operation.

There is practically no disagreement regarding the necessity of immediate operation when an abscess is present about the pancreas. The decision as to the indications for operation in such

instances is not as difficult as might be expected. In the first place, it is generally agreed that infection, as far as suppuration is concerned is a secondary manifestation of acute pancreatitis. In other words, the possibility of the presence of an abscess during the first day or two is quite remote. If the patient has fever, which after two or three days shows a tendency to increase and is accompanied with such peritoneal manifestations as nausea, vomiting increasing muscle spasm and elevation of the white count the presence of an abscess will be indicated quite definitely and laparotomy will be necessary. In such cases the operative procedure will usually consist of nothing more than drainage of the abscess. It may be advisable to make openings in the pancreas and adjacent soft tissues by blunt dissection particularly if a large abscess is not encountered. However, small abscesses may resolve spontaneously as was exemplified by a patient observed by the author three weeks after the onset of severe abdominal symptoms and who remained so ill for three succeeding weeks that operation was thought to be too dangerous. When her condition finally improved laparotomy was performed. A large indurated mass which undoubtedly represented an abscess that had resolved to the point where drainage was no longer necessary was found. The gall bladder which contained many stones was removed. The patient complained of abdominal distress for many weeks but ultimately recovered completely.

POSTOPERATIVE CARE

Patients who have been operated on for acute pancreatitis usually require more painstaking care than patients undergoing the average type of laparotomy. A transfusion immediately after operation is strongly indicated for the patients who are acutely ill. Because of the desire not to stimulate the pancreas, and the danger of peritonitis food should not be allowed for two or three days depending on the patient's progress. At the drainage site an adequate opening must be maintained because sloughing of portions of the pancreas is not an uncommon occurrence. It is obviously preferable to allow these necrotic portions of the gland to escape outside of the peritoneal cavity particularly if infection has developed. If the surface of the pancreas has been split the wound should be watched daily for the possible development of tryptic digestion, a complication which fortunately occurs only occasionally. A moderate amount of irritation commonly occurs but this can be controlled by daily dressings, and if the wound is kept dry. If digestion

of the wound edges should occur, there are numerous protective chemicals, such as zinc oxide, kaolin, and dilute hydrochloric acid, which may be used, but none will be as effective as the frequent or constant suction of all secretions from the wound. The urine and blood sugar should be watched closely for the development of diabetes, a complication (7) which occurs only in about 10 per cent of the cases. Insulin may be required.

Abscesses may form about the pancreas, as well as in numerous other sites, as the result of bacteremia or septicemia, a complication which usually does not develop until several days after the onset of symptoms. Drainage of these abscesses will, of course, be indicated.

SEQUELÆ

In unoperated cases, one of the most frequent and significant sequelæ is the recurrence of the pancreatitis. The same may be said of the operated group if cholecystectomy and removal of common-duct stones have not been performed as indicated.

One of the most common factors in the development of pseudocysts of the pancreas undoubtedly is acute pancreatitis. It is quite true that they are more apt to develop in the unoperated cases, a factor which in itself is in favor of early operation.

One of the most serious sequelæ is pancreatic asthenia, the manifestations of which have been described by Whipple (35). Important symptoms are anorexia, nausea, pallor, weakness, and loss of weight. If the patient exhibits such symptoms large doses of pancreatic extracts should be given. Fortunately this sequela is rather uncommon and develops so slowly that weeks may pass before significant symptoms are evident. A patient under observation at the present time had a cholecystectomy and choledochostomy several weeks after the onset of an acute edematous pancreatitis. At the present time, which is four weeks after operation, the blood amylase (Fig 2) is still elevated (average about 1,000) and the patient still complains of weakness and anorexia. It is too early to determine what the prognosis will be. In some instances involvement of the liver, consisting chiefly of enlargement with fatty infiltration will take place. If there is evidence that this complication is developing, lipocæa (Dragstedt, 8) should be given. If untreated the ultimate prognosis is very poor.

CONCLUSIONS

Gall-bladder disease is perhaps the most constant etiologic factor in the development of

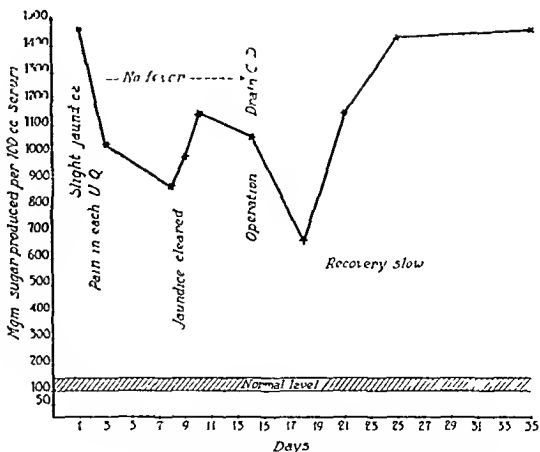


Fig 2 The above graph represents the amount of retention of amylase in the serum of a patient with acute edematous pancreatitis, who developed an attack of epigastric pain three days before admission to the hospital. We delayed operation a few days expecting the amylase to drop to normal, as usually occurs. This elevation persisted for two weeks. Operation was finally performed in the hope that correction of the biliary disease would exert a curative, or at least favorable influence on the pancreatic disease, as it usually does. As will be noted on the chart, operation (cholecystectomy and choledochostomy for stone) was not followed by recession of the blood amylase over the period of three weeks illustrated on the chart. After two more weeks the amylase had dropped to 500, but the patient was developing symptoms of pancreatic asthenia suggesting that the pancreas was being destroyed as far as the external secretion was concerned. When last observed five weeks after operation the blood sugar was still normal. The above response, i.e., failure of return of blood amylase to normal within several days, is so rare that the prognosis cannot be determined by past experiences.

either of the types of acute pancreatitis. Prophylactic eradication of this source by cholecystectomy is justifiable, and depends upon the usual indications for gall-bladder surgery. There may be an additional indication even when attacks of cholecystitis are infrequent, if the presence of pancreatitis can be determined by clinical signs and from the amylase determination. It is generally agreed that the treatment of acute edematous pancreatitis should be conservative, to be followed later by gall-bladder surgery as indicated. Confusion still exists as to whether conservative treatment or immediate operation is the treatment of choice in acute pancreatic necrosis. A review of recent reports during the past few years indicates quite clearly that many surgeons are obtaining better results by treating this type of disease conservatively at first, and later by operating on the gall bladder or bile ducts as indicated. These reports and recent personal

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SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Coates, A. E.: Incisional Hernia *Med J Australia*, 1938, 1 7

Among the causes of incisional hernia, there are those over which the operator has no control because of the problem of drainage and subsequent infection of the abdominal wall, and there are other cases in which the incision has been poorly planned by the operator and in which there is faulty suture of the peritoneum.

The histories of 144 patients with incisional hernia who were operated upon at the Royal Melbourne Hospital in the period between 1931 and 1936 were analyzed. It was found that incisional hernia is more likely to occur in females of middle age and over. Lower midline and paramedian incisions are more prone to be followed by herniation, for these reasons:

The incision is not anatomically sound from the point of view of easy healing, although it is necessary for access in many cases. Suturing is difficult, and tearing of the peritoneum at the suture line is liable to occur, pressure of the intestine, especially when the Fowler position is employed, is directed to the lower half of the abdomen. The hernia is a relic of the operation and is due to faulty suture. Oblique incisions of the Kocher type and transverse incisions are less liable to cause hernia. McBurney's muscle-splitting incision, while anatomically sound, requires careful suture, and drainage, when necessary, should be judiciously provided. Despite all care, such hernias will occur as a result of infection of the tissues. Repair is easy, and the occurrence of hernia after the McBurney incision should not deter the operator from employing this direct approach to the offending appendix.

Predisposing causes of incisional hernia include chronic cardiac and respiratory diseases, diabetes, renal diseases, cancer, and general diseases.

Incisional hernia predisposes to intestinal obstruction, strangulation of the omentum, a sense of debility, and loss of abdominal support of the viscera.

In this group, 8 deaths occurred as a result of cancer of the pancreas, carbuncle, and obstruction of the small bowel. The actual mortality from the hernia and its immediate complication was a little over 2 per cent.

The author emphasizes rational planning of incisions to decrease the liability to rupture. The oblique incision of the McBurney type is especially desirable in the operation for acute appendicitis. In general, patients with broad costal margins and abdomens are more suitably operated upon through transverse or oblique incisions. The transverse incision is less distressing to the patient with a post-operative cough. Lange's lines should be followed as often as possible whenever incisions are to be

made. However, the paramedian incision is such a useful one that it will always remain a standard approach to the interior of the abdomen. Similarly, the lower midline incision will continue to be the one of choice for exploration of the pelvis. The correct placing of drain tubes through a small incision placed at a distance from the laparotomy wound is helpful in preventing the breaking down of the fascia by infection, and allows the peritoneum and fascia to be accurately and completely closed layer by layer.

In the repair of incisional hernia, excision of the scar with accurate dissection of the aponeurotic and muscle layers, together with accurate anatomical closure of these layers constitutes the most successful method for cure of these ruptures. Additional aids to closure include imbrication of the fascia, relaxing incisions in the fascia at a distance, and the use of fascia lata strips to repair the defect. Silk-worm-gut tension sutures should pick up the aponeurotic layers and be left *in situ* for at least two weeks. Postoperatively, the patient should be kept in a position to promote relaxation of the abdominal muscles. In fat, flabby patients a heavy canvas belt suspended by weights and pulleys from a longitudinal beam holds up the sides of the abdomen and prevents sagging, with a consequent drag on the suture lines if such are vertically placed. Abdominal distention should be prevented by the control of undue vomiting and paresis of the bowel.

The operation for repair of incisional hernia is not a dangerous one, and patients should be encouraged to have the condition treated surgically, since much discomfort and pain may be avoided, and fatal obstruction may otherwise eventually develop. Economically, it is unwise to allow a patient in otherwise normal health to be disabled by an incisional hernia.

JOHN E. KIRKPATRICK, M.D.

Horsley, J. S.: Peritonitis *Arch Surg*, 1938, 36 190

A splendid review pertaining to the anatomy, histology, physiology, and repair of the peritoneum is presented.

The pathological picture and the symptoms of acute peritonitis as well as the cause of spreading peritonitis are described in detail.

The following types of peritonitis of specific origin are discussed: bile and liver, pneumococcic, gonococcic, and tuberculous.

The treatment of the various forms of peritonitis is considered in detail. The cause of death from peritonitis is probably the absorption of toxins produced by the bacteria.

The treatment of acute appendicitis is discussed and the general principles of such treatment are summarized as follows:

1. Operation may be performed at any stage as soon as the diagnosis is made.

clinical experiences have led the author to modify his previous impression and favor conservative therapy. Conservative treatment as modified according to Kowland's recommendation should consist of

- 1 Adequate morphine for pain
- 2 Immediate determination of blood sugar and urinary or blood diastase
- 3 Roentgenograms for the determination of gas under the diaphragm
- 4 Nothing by mouth
- 5 Wangenstein suction with removal of gastric and intestinal secretions to prevent stimulation of the pancreas

In spite of the desire to maintain a conservative attitude there will be numerous occasions when an emergency operation will be necessary particularly when differentiation from a perforated viscus cannot be made. In general immediate operation should be performed (1) when the diagnosis is uncertain, (2) when signs of peritonitis, including severe muscle spasm, are present and (3) when an abscess is obviously present. If the conservative attitude is maintained operation should not be performed (1) when the diagnosis is certain (2) when the evidence of vascular collapse is so severe that operation would be dangerous and (3) as long as the inflammatory process appears to be confined to the retroperitoneal tissues about the pancreas. Recovery of the patient from epigastric distress is frequently slow even though the proper operative procedures upon the biliary tract have been carried out.

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it is being realized that healthy tonsils must have some use and that simple enlargement, so long as it is not causing obstruction to respiration, is due to the response of the body to some lack of hygiene or to some dietetic deficiency. The author quotes Layton, speaking from a large clinical experience, that in children under from five to eight years of age removal of the tonsils impairs resistance to infection. He cites other instances in support of the theory that the lymphoid tissue of the tonsillar ring is associated with the protection of the young subject from bacterial infections and to substantiate the fact that it is of value in the economy of the growing child.

With regard to the relation of the intestinal lymphoid tissue to bacteria, there seems to be definite evidence that such a relation exists. From a large number of experiments which the author conducted with rabbits, he was able to determine that there is a regular flow of cells from the lymphoid tissue into the lumen of the alimentary canal and that these cells are almost entirely small lymphocytes. His next effort was to attempt to discover what the reaction of the lymphoid tissue to pathogenic bacteria was. For this purpose cultures of (1) *hoveine tuhercle bacilli* and (2) *staphylococcus aureus* were used in a series of experiments on 9 rabbits. The results suggest that bacteriolysis takes place either in the lumen of the bowel or in the lymphoid tissue, also that bacteria may pass rapidly through the lymph follicles. Results were most marked in the appendix.

The effect of deficiency in Vitamin A was also studied. Several batches of rabbits were put on a diet deficient in Vitamin A. In the rabbit the lymphoid tissue of the alimentary canal is normally associated with the presence of gram-positive bacteria. It became obvious that the diet deficient in Vitamin A produced a marked increase in the number of organisms in the lymphoid tissue. Not only were they present in large numbers scattered throughout the deeper follicles, but they appeared to be massed in colonies as if they were multiplying locally. Especially was this the case in the lymphoid tissue of the vermiform appendix. Moreover, the lymphoid follicles began to show signs of atrophy when the animals had been deprived of Vitamin A. In the later stages the animals began to develop signs of xerophthalmia, and it was in these cases that the lymphoid follicles were represented by only a very thin layer of leucocytes. These findings were so marked that it was decided to try to determine if the re-administration of Vitamin A would cause a regeneration of the lymphoid follicles. Accordingly, a rabbit was chosen which had been on a diet deficient in Vitamin A for several months and in which xerophthalmia was well developed. The animal was given a similar diet with the addition of carotene in oil for one week. It was then killed and the appendix and other lymphoid organs were removed for histological study. It was found that the deeper follicles showed the characteristics of

active regeneration with both superficial and deep follicles present.

While this work requires confirmation and more extensive study it suggests a possible reason for the decline in the protective mechanism of the organism against infection and also for the loss of immunity against bacterial infection in deficiency of Vitamin A.

MATHIAS J. SEIFERT, M.D.

Henderson, F. F., and Gaston, E. A.: Ingested Foreign Body in the Gastro-Intestinal Tract. *Arch Surg*, 1938, 36 66.

The authors found that the average time required for foreign bodies to transverse the gastro-intestinal tract was four and eight-tenths days for blunt bodies, five and eight-tenths days for bodies sharp at one end, and seven days for bodies sharp at both ends. Open safety pins required only four and six-tenths days. Thus, if a foreign body has not been recovered from the stool in seven days it is probably lodged somewhere in the gastro-intestinal tract.

If the foreign body remains in the same location in relation to the viscera for five days or longer, surgical intervention should be considered. Immediate operation is indicated if tenderness develops in the abdomen during the time that the patient is under observation.

The authors reviewed 71 cases of perforation and found the frequency of perforation in the stomach to be 36.6 per cent, duodenum 13.9 per cent, small intestine 16.6 per cent, cecum 15.3 per cent, and the colon 16.6 per cent. The perforation may be acute or may be walled off by inflammatory tissue (chronic perforation). The treatment of perforation of the gastro-intestinal tract is surgical. Acute perforation occurs most often in the small bowel or cecum, while chronic perforation occurs most often in the stomach and colon.

Open safety pins are a problem in themselves. If the spring is foremost, the pin will usually traverse the gastro-intestinal canal safely. If the point and head are foremost, it usually becomes impacted at the outlet of the stomach. Some objects are too long to pass through the duodenum and must be removed surgically.

Treatment in the absence of perforation is conservative until it is definitely shown that the object will not pass naturally. Careful examination of the abdomen and x-ray examinations should be made frequently. Surgical intervention is indicated immediately in cases of perforation. Bodies that remain in one part of the viscus from five to seven days should be removed surgically. The stools should be strained to confirm passage of the foreign body.

EARL O. LATIMER, M.D.

Sherman, E. D.: Gastro-Intestinal Manifestations of Lymphogranulomatosis (Hodgkin's Disease). *Arch Int Med*, 1938, 61 60.

The author reports 2 cases of gastro-intestinal lymphogranulomatosis and reviews 73 case reports collected from the literature.

2 A McBurney incision should be made through which the appendix may be approached and drained if necessary established

3 The appendix should always be removed

4 Suction should be used to remove pus or exudate gauze should not be placed within the peritoneal cavity and on no condition should the pus or exudate be sponged away

5 The stump of the appendix should be treated simply, by merely tying it and disinfecting it it should not be buried

6 The bowel should be given rest by refraining from proctoclysis and enemas at all times and by supplying the water electrolytes and calories by the continuous intravenous injection of 5 per cent dextrose in Ringer's solution

CARL R. STEINLE M.D.

Foster A. J. Jr. Disease of the Mesenteric Lymph Nodes Its Relation to Appendicitis Gastro-Intestinal Infections and Generalized Diseases Report of 123 Cases Possible Etiology and Treatment *Arch Surg* 1938 36 28

The purpose of this article is to consider the function of the mesenteric lymph nodes which has to do with infection to report the data on the cases of disease of the mesenteric lymph nodes occurring in one hospital from 1914 to 1936 and finally to suggest a broader interpretation of the rôle of the mesenteric lymph nodes in disease as encountered in the abdomen

Mead has pointed out that the total number of mesenteric lymph nodes varies greatly from about 30 in a premature stillborn infant to 300 or more in a full term child. They occur in three definite locations. The first group is located at the last anastomosing branching of the vessels before the intestine is reached the second group at the next larger anastomosing branches of the large mesenteric vessels while the third group is located at the root of the mesentery where the large vessels arise. The third group generally constitute the largest lymph nodes. Arnold at the University of Illinois pointed out the great variability in size under varying conditions and stated his belief that many organisms penetrate the intestinal mucosa only to be destroyed later by the mesenteric lymph nodes and liver which contain the phagocytes needed for such function. Heyd recognized the great task of the liver in destroying organisms that are absorbed from the intestinal canal.

It is not possible to conclude definitely that mesenteric lymphadenitis is a definite clinical entity distinct from appendicitis or many other intra-abdominal conditions. A close study of 123 cases revealed some very interesting facts. In approximately 90 per cent of these cases appendectomy was performed at one time or another. Proof of definite appendiceal inflammation was positive in approximately 87 per cent by microscopic evidence. A clinical diagnosis of tuberculous mesenteric lymphadenitis was made in 32 per cent of the 123 cases

but this was not borne out by microscopic evidence or other proof except in a few cases. Associated conditions included visceropertosis gall bladder disease constipation and intra abdominal tumor. The first occurred in 8 cases. From clinical reports in the literature it appears that the tremendous importance of the mesenteric lymph nodes in infections of the gastro intestinal tract and in generalized diseases has been underestimated.

The suggestion is made that gastro intestinal stasis and conditions attributing to it allow chronic absorption of histamine like substances which may cause mesenteric lymphadenitis especially when the appendix is diseased. Bacterial sensitivity in the gastro intestinal tract is probably not sufficiently appreciated (it may possibly result from the appendix), and may offer a new line of approach toward future immunization and therapy.

JOHN W. NUTZ M.D.

GASTRO INTESTINAL TRACT

Thompson H. G. The Lymphoid Tissue of the Alimentary Canal *Brit M J* 1938 1 2

The lymphoid tissue of the alimentary canal consists of the tonsillar and pharyngeal ring Peyer's patches in the lower part of the small intestine the vermiform appendix and the solitary follicles of the large intestine. The author stresses the apparent relation of the position of these places of lymphoid tissue to bacterial infection. Thus the tonsillar lymphoid ring is at the entrance to the pharynx where the path of the food and the path of the inspired air cross one another i.e. the point where the maximum possible combined air borne and food infection may occur. Peyer's patches are situated where the curbing anti bacterial action of the gastric juice and the bile begins to lose its power and micro organisms begin to multiply. The vermiform appendix with its lymphoid tissue is situated at the apex of the caecum at the point where there is probably the greatest stagnation of broken-down food stuffs and where bacteria are most able to multiply. The solitary follicles of the large intestine are likewise in a position where there is marked fermentation and bacterial action.

It is at the lymphoid ring at the back of the throat and nose that bacteria are taken in by respiration and food. For the most part they are swallowed and then destroyed by the acid gastric juice but before entering the esophagus they have incorporated with them the salivary corpuscles which are the lymphocytes discharged by the lymph follicles of the tonsils. The author suggests that possibly the discharged lymphocytes or salivary corpuscles react to the bacterial toxins and supply a dose of immune bodies which are swallowed and absorbed by the alimentary canal and help to establish immunity in this manner. The author touches on the matter of tonsillectomy and states that a few years ago it was the fashion for children to have their tonsils removed on the slightest pretext. Now

To answer the question of whether it would not be wiser to treat all patients with ulcer surgically and then treat only those who failed to obtain relief medically, data was presented on 82 patients, 13 of whom had no particular surgical indication. Seven of these died from postoperative complications. Obviously medical therapy alone would have been better for these patients.

SAMUEL J. FOGELSON, M.D.

Maycock, W. d'A.: **Intestinal Strangulation: The Depressor Properties of the Peritoneal Transudate** *Brit J Surg*, 1938, 25 677

The author reported the results of experiments on cats, to determine the relative importance of toxic bodies present in the peritoneal fluid, and formed as a result of non-viable loops of strangulated intestine. He collected peritoneal transudate in rubber bags surrounding the non-viable loops of small intestine. The acute depressor effect of this material was believed to be accounted for by the amount of histamine and choline that was present in the transudate. He found that histamine had little or no effect in causing death in intestinal strangulation.

A group of experiments were carried out in which the peritoneal transudate was given intravenously to normal, anesthetized animals, with no depressant action upon the blood pressure. When death resulted from such an injection it did not resemble that observed clinically in strangulation of the intestine. Death did result following the slow intravenous infusion of a peritoneal transudate when the total circulating fluid in the normal anesthetized animal was reduced. Peritoneal injection of peritoneal transudate into normal, anesthetized animals had no marked harmful or permanent effect. When the intraperitoneal injection was made into unanesthetized animals, with a diminished total circulating fluid, there was no harmful effect in the majority of instances.

From these experiments the author concluded that the toxic action of the peritoneal transudate forming after non-viable intestinal strangulation is not sufficient, in the majority of cases, to account clinically for the circulatory collapse seen in this condition.

ROBERT ZOLLINGER, M.D.

Bonomini, B.: **The Influence of the Mesentery in the Production of the Radiological Aspects of Intussusceptions** (Influenza del mesentero nella produzione degli aspetti radiologici delle invaginazioni) *Arch ital d mal dell'appar digerente*, 1937, 6 457

On the basis of numerous radiological examinations of intussusceptions in different segments of the digestive tube, Bonomini is convinced that the mesentery is not limited as usually described in the radiological picture, a simple arc with walls more or less folded. This is only the shortest form of a more complex curve, sinusoid or ellipsoid, in which the mesentery has the function of an axis. The radiological expression of the sinusoidal or ellipsoid course

is a polycyclic contour of the intussusceptum with arches in alternate directions, its folds appearing as fans pointing in opposite directions.

The geometrical and anatomical characteristics of the mesentery influence the characteristics of the intussusception in the following manner: the root of the mesentery prevents the accumulation of any considerable number of loops in the intussusception when the mesentery is elongated. On the other hand, the forms of intussusception in which most of the small intestine is invaginated are favored by a short or peduncular type of abdominal insertion. The nearer the entrance of the intussusceptum to the root of the mesentery, the longer is the invagination. The longer the intestinal insertion of the mesentery is found to be, the greater is the number of loops which can be invaginated.

The breadth of the mesentery, the distance between its abdominal and intestinal insertions, is the factor which determines definitively the absolute length of the intussusceptum. The intussusceptum cannot be much greater than the breadth, even when the possibility of elongation by caudal and lateral rotation of the distal part of the median loop and distensibility of the mesentery are taken into consideration.

The thicker the mesentery, the less is the possibility of penetration of the loops into each other.

In invaginations of the colon, any noteworthy elongation of the intussusceptum is hindered.

The above-mentioned principles are illustrated by diagrams and numerous roentgenograms. Continental references are given in the original article.

M. E. MORSE, M.D.

Abbott, W. O., Karr, W. G., and Miller, T. G.: **Intubation Studies of the Human Small Intestine. VII. Factors Concerned in the Absorption of Glucose From the Jejunum and Ileum.** *Am J Digest Dis & Nutrition*, 1938, 4 742

The authors conducted various intubation experiments on the absorption of glucose from the human intestine. The evidence derived from the various experiments when taken together indicates that as glucose enters the gut, tonicity of the fluid is maintained by (1) a shift in the electrolyte content, (2) the absorption of glucose, (3) an inflow of hypotonic fluid, and (4) a propulsive type of peristalsis which varies in intensity with increase of concentration above isotonicity. Whether the motor response is due to mucosal irritation or to the stimulus of impouring fluids stretching the intestine, the result is a rapid dispersal of nutrient material prior to the period of depressed peristalsis. Thus, the intestine is equipped with a set of very effective mechanisms for disseminating and for reducing the concentration of hypertonic fluids in the shortest possible time.

The authors believe that the stomach and duodenum are able to deliver without delay a dilute solution of glucose and electrolytes to the jejunum and ileum. Thereafter the small intestine rather slowly

The diagnosis of Hodgkin's disease of the gastro intestinal tract is usually made after operation or at necropsy, on the basis of the histological picture and not on that of the gross anatomical features. The disease frequently simulates gastric carcinoma, gastric ulcer enterocolitis or intestinal obstruction.

There are no specific roentgen findings typical of the condition. The characteristics of generalized Hodgkin's disease, such as superficial glandular enlargement, enlargement of the liver and spleen, and hematological changes are usually absent. The diagnosis is made after operation or at necropsy and rarely by biopsy. At times it is very difficult to differentiate the microscopic picture from lymphosarcoma.

Holmes, Dresser and Camp have shown the striking effects of roentgen therapy on lymphoblastomas. Ruggles and Stone strongly advise roentgen therapy as the treatment of choice. Susag and Singer advocate surgical resection combined with roentgen therapy for localized lymphogranulomatous lesions of the gastro intestinal tract.

JOHN W. NUTZUM M.D.

Hartmann H. Contribution to the Surgical Treatment of Carcinoma of the Stomach According to the Experience in 726 Cases in the Surgical Clinic of the University of Giessen During the Years from 1905 to 1935 (Beitrag zur Klinik und chirurgischen Behandlung des Magen-carcinoms nach den Erfahrungen bei 726 Faellen der Chirurgischen Universitaets-Klinik zu Giessen aus den Jahren 1905-1935). 1937 Giessen Dissertation.

Of the 726 cases of carcinoma of the stomach which came to operation in the Surgical Clinic at the University of Giessen during the period from 1905 to 1935, 323 were examined and subjected to biopsy, 220 underwent gastroenterostomy and only 183 were subjected to radical operation. Only 143 of the last group were satisfactory for general statistical study and 107 for special studies. In the remaining cases sufficient information could not be secured. A so called permanent cure of more than four years was obtained in 12 per cent of the entire series. As to postoperative symptoms the cases fell into two groups. In a great number the patients were free from symptoms and able to work for a few months after which the pains recurred and death followed. In the others there were no symptoms for a relatively long period of time, then they suddenly returned and death took place in a short time.

In conclusion the author states that these statistics do not vary much from reports in the literature of today. Although there were cases which showed surprisingly good results about two-thirds of the patients came too late for operative relief. It must therefore be concluded that radical treatment does not lead to good results.

It is of the utmost importance to know that in countries other than Germany the struggle against cancer is being carried out actively. For example in Belgium examination of a series of women was per-

formed, and of 2,000 women examined for carcinoma of the breast, 3 were found who had carcinoma but did not suspect it. Perhaps similar measures could be utilized in Germany, especially in those cases with some history of stomach trouble or with a familial predisposition to cancer. These methods, however, should be used only after careful and extensive educational measures have been undertaken.

(RAESCHKE) JOHN A. GRIS M.D.

Monroe R. T. and Emery E. S. Jr. Causes of Death in Patients with Peptic Ulcer. *New Eng. Land J. M.*, 1937, 217, 729.

From 1913 to 1932, 1,428 patients with peptic ulcer were treated in the Peter Bent Brigham Hospital. Although 136 of these patients could not be traced, the authors are fairly confident that few if any, died without their knowledge. One hundred and sixty one of the remaining 1,272 patients or 11.3 per cent of the total who died are the basis for this report. Peptic ulcer was the direct cause of death in only 87 or 50 per cent of those who died, and 6.1 per cent of the total number of patients treated. Perforation was the cause of death in 28 or 31.2 per cent of the patients who died from their ulcers, hemorrhage in 20 or 23 per cent, obstruction in 4 or 4.6 per cent, surgical complications in 39 or 34.4 per cent, and in 5 patients, or 5.7 per cent of the cases, the cause of death was not determined.

The average age of the patients who died of ulcer was fifty-eight and three tenths years as contrasted to fifty two and six tenths years, the average age of the patients who died from unrelated conditions. The average age at the time of death for the entire group of 161 patients was fifty five and nine tenths years.

This study was started with the objective of determining whether patients lived longer after medical or after surgical therapy. The statistics confirmed a previous impression that neither medical nor surgical therapy cured the disease. Of the 52 patients who survived an operation, 31 died subsequently of their ulcers. In other words the ulcer ultimately killed 60 per cent of the patients who survived the operation as contrasted to 43 patients or 31 per cent who received only medical therapy. That is to say, ulcer caused death of a higher percentage of patients who survived an operation than of patients who were treated medically.

The comparative value of surgical and medical care in prolonging life and the effects of therapy on disease may be determined in another way such as contrasting the average age at death following the two forms of therapy. This average age was sixty three and six tenths years for the medical cases, and fifty and two tenths years for the surgical. These figures may suggest that the surgical treatment was less satisfactory than the medical but another possible explanation may be that the patients were operated upon because of the greater severity of the condition.

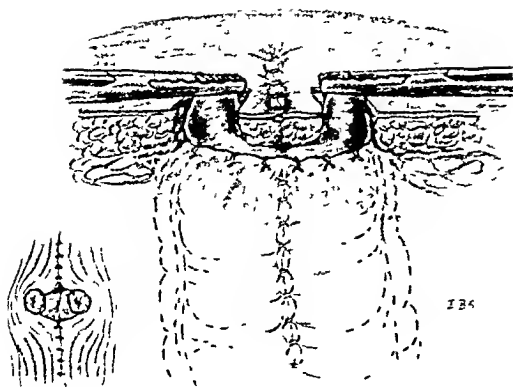


Fig 1 Diagrammatic section to show the two cut ends of the bowel drawn up through the small openings by the Kocher clamps, and the main wound sutured. Inset shows position of muscle in relation to the ends of the bowel

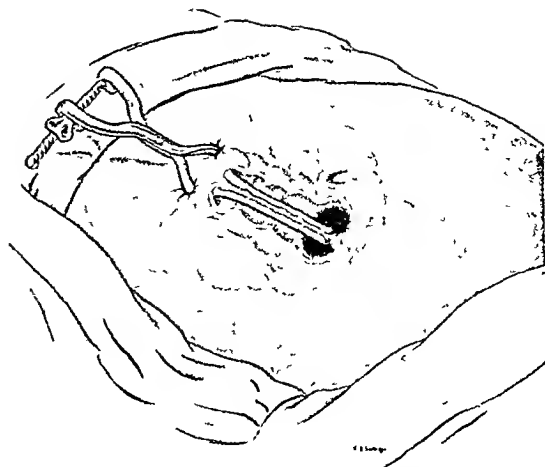


Fig 2 Diagram showing the enterotome applied. For diagrammatic purposes the abdominal wall in the drawing is considered transparent and the spur semisectional

so that it cannot be soiled in any way by even the smallest quantity of feces, from which the fecal contents have been washed out, and which has been allowed to remain functionless until the bacterial content has been considerably reduced. The two important requirements in operating on the defunctioned distal colon are (1) that the operation is carried out under favorable conditions, in the absence of septic feces, functionless, collapsed and retracted colonic walls, and low bacterial content, and (2) that the wound in the intestine is allowed to heal under these conditions. The author has been able to carry out end-to-end or side-to-side anastomoses in old and debilitated cancerous patients, to remove almost the whole of the sigmoid in inflammatory diverticular tumor, and eventually join the upper part of the sigmoid to the upper part of the rectum, to remove carcinomas of the lower end of the sigmoid, and anastomose the middle of the sigmoid to the divided rectum, to remove inflammatory diverticular tumors of the sigmoid, which by the ordinary methods of operating, would be quite irremovable, to remove a series of innocent adenomas of the sigmoid by slitting it longitudinally, dissecting the adenomas out of the mucous membrane, and then closing the lumen of the bowel, and to cure the rectovesical fistula arising from diverticulitis of the sigmoid.

In the surgery of the distal colon, there are two main fields: the surgery of malignant conditions, the main one of which is carcinoma of the sigmoid, and the surgery of innocent affections, which comprise inflammatory diverticular tumors with their complications, rectovesical fistulas, single or multiple adenoma of the sigmoid, and endometrioma of the lower part of the sigmoid or the rectosigmoid junction. Complete defunctioning of the distal colon, especially when it is prepared by daily lavage, even if it be for the short period of a month, brings about

such a profound change in the pathogenicity of the bowel contents and in its walls, that the mortality rate of operations in the carcinomatous colon is greatly reduced. The short period of defunctioning improves not only the local resistance of the patient's colonic tissues, but also the patient's general resistance.

The method of operation on the defunctioned colon involves the following:

Preliminary exploration of the abdomen. The main object of the exploration is to make an examination of the growth and of any glandular involvement with a view to its operability, and to ascertain if there is any metastatic spread of the growth, which would prohibit its radical removal.

The construction of the disconnecting anus. In regard to the disconnecting anus, there are four requirements: (a) that it should completely disconnect, (b) that it should be more or less continent, (c) that it should be capable of being closed easily, and (d) that it should be situated well away from the area of the operation. The first is obtained by dividing the bowel and implanting the divided ends into separate openings in the abdominal wall (Fig 1), the second, by making a small fistula-like anus at the beginning of the transverse colon with an opening so small that it can be easily occluded, the third, by combining the small fistulous anus with a very long spur, and the fourth, by making the disconnection in the upper right part of the abdomen at either the proximal part of the transverse colon or the hepatic flexure.

Preparation of the excluded distal colon. The contents of the distal colon are washed out, if possible, from the abdominal fistula. It may also be found necessary to wash out the rectum from below the growth. Lavage with antiseptic solution helps to diminish the bacterial content. The longer the distal

extracts the sugar from the fluid as the intestinal contents are propelled towards the colon. If a definitely hypertonic solution enters the jejunum and ileum a coordinated process of dilution and distribution in a very short time restores the fluid to about the osmotic pressure of blood plasma.

The authors assume from part of their experiments that in the case of a concentrated glucose solution the stomach and duodenum play the major role in absorption.

EARL O. LATIMER, M.D.

Nygaard K. A., and Walters W. Malignant Tumors of Meckel's Diverticulum. Report of a Case of Leiomyosarcoma. *Arch Surg* 1937 35 1159

In the survey that we have made we have found a total of 20 cases of malignant tumors of Meckel's diverticulum: 6 cases of carcinoma and 14 of sarcoma. In the 16 cases in which the sex was stated 8 of the patients were males and 8 were females. In view of the statement that Meckel's diverticulum is found three times more frequently in males than in females it would appear from this compilation that there may be a greater tendency toward malignant growth in Meckel's diverticulum in females than there is in males. However this finding may be entirely changed by the analysis of a larger series of cases.

One of the cases of carcinoma reviewed in this series is of particular interest to pathologists. In this case an adenocarcinoma was found growing in a tumor formed of heterotopic gastric mucosa. If the patient had continued to live without an operation it would have been only a question of time before the carcinoma had infiltrated the entire heterotopic gastric mucosa and left no trace of its origin in this tissue.

If this series of 6 cases of carcinoma and 14 cases of sarcoma of Meckel's diverticulum is again considered the prevalence of sarcoma so far seems obvious. Considering malignant tumors of the stomach the relation is exactly the reverse: gastric sarcomas making up about 1 per cent of all malignant gastric tumors. There does not seem to be any exact parallelism between pathological processes in Meckel's diverticulum and pathological processes in organs from which the heterotopic tissue of a diverticulum may be considered to have been derived. Still it appears that the heterotopic tissue undoubtedly plays an important rôle in the pathological process in the organ under discussion.

In a review of the available clinical data in this series there are certain facts which may be emphasized: a malignant tumor of Meckel's diverticulum may be present without for a time at least producing any clinical symptoms as in the case described by Symmers. When clinical symptoms were associated with malignant tumor of Meckel's diverticulum the symptoms recorded appeared naturally to fall into two main groups: (1) primary symptoms referable to the presence of the tumor and (2) secondary symptoms referable to the perforation of

the diverticulum, leading to localized or diffuse peritonitis or to invagination of the tumor together with the diverticulum.

Unfortunately, in this series the primary symptoms which may reasonably be assumed to be caused by the tumor itself were rather vague. In order to simplify the matter these symptoms may be considered under the following two sub-headings:

1. Symptoms of abdominal distress or pain. Abdominal distress appears to have occurred in more than 50 per cent of the cases; it was of an intermittent colicky type and of a moderate degree and was usually located in the right side of the lower part of the abdomen with frequent projection to the epigastrium.

2. Symptoms caused by the presence of an abdominal tumor. In 5 cases a palpatory finding of a tumor had been made prior to operation. In 2 of these cases the growth presented itself as a pelvic tumor and in only 2 was it found in the iliocecal region. A palpatory finding which may be of some consequence in localizing the tumor is the occasional tendency for the growth to escape partly or completely from the palpating hand, a phenomenon which suggests the presence of a tumor in the ileum.

Symptoms of localized or diffuse peritonitis were encountered in 4 cases in this series. In 3 of them the diffuse peritonitis resulted from necrosis and perforation of the diverticulum and the patients died in the fourth case local peritonitis arising from a ruptured appendix was diagnosed pre-operatively and the patient recovered after the operation.

In considering the foregoing symptoms one is left with the impression that they are of little direct diagnostic importance and that they may also fit a variety of abdominal conditions to be considered at the bedside. The condition under discussion however is primarily a surgical problem and the surgeon may be interested in knowing how great a chance he has of getting the patient to operation even when no clinical diagnosis has been made pre-operatively. There is good reason to expect that all patients presenting an abdominal tumor or clinical signs of intussusception and ileus or peritonitis will be considered as needing surgical assistance. On this basis 9 of the patients in this series would be considered candidates for surgical exploration. In other words we have reason to expect that at least 50 per cent of patients with malignant tumors of Meckel's diverticulum would be referred for surgical treatment.

In the cases reviewed no evidence of metastasis was ever found. In two cases however (one of Mathews and one of Faust and Walters) there was evidence of recurrence of the tumor five years after its removal. This of necessity makes for a guarded prognosis.

Devine Sir H. Operation on a Defunctioned Distal Colon. *Surgery* 1938 3 165

A defunctioned distal colon is one which has been completely disconnected from the alimentary canal.

function, (5) miscellaneous tests such as the Takata-Ara test, (6) measurement of the tendency to bleed, (7) measurement of the elimination of bile salts, (8) quantitative estimation of phosphatase, and (9) tests of the detoxifying function of the liver. It has been emphasized that many of the procedures are not functional tests at all but merely laboratory procedures which throw some light on one or another aspect of disease of the liver. We have attempted to outline the particular field of usefulness for each of the tests and to point out the fact that we do not consider any of them infallible or universally applicable.

For practical purposes it may be said (1) in types of disease of the liver not associated with jaundice, information gained from the study of retention of bromsulfalein is as reliable as that which can be gained in any other way, and that under these conditions other tests give chiefly confirmatory evidence, (2) in cases of jaundice, some information, which is not altogether reliable, as to the possible hepatogenous or obstructive nature of the jaundice in any given case can be had by studies on excretion of the galactose, the value for cholesterol and cholesterol esters in the plasma, and the value for serum phosphatase, and (3) the best information as to the state of functional activity of the liver in cases of jaundice can be gained from a consideration of the value for the serum bilirubin, its daily variations, and a knowledge of the anatomical changes which these may represent. So far as indirect methods of measuring liver function in the presence of icterus are concerned, the hippuric-acid test gives reasonably accurate results, which should not, however, supplant the impressions gained from purely clinical study.

Gustafson, E. G.* An Analysis of 62 Cases of Primary Carcinoma of the Liver Based on 24,400 Necropsies at Bellevue Hospital. *Ann Int Med*, 1938, 11 889

In 24,400 consecutive autopsies performed at Bellevue Hospital, New York, during the period from 1906 to 1936, there were 62 cases of primary carcinoma of the liver. Three gross forms of the disease were noted: (1) the nodular form characterized by discrete nodules varying from a few millimeters to several centimeters in size; (2) the massive form in which there is one massive nodule occupying usually the right lobe of the liver, and (3) the diffuse form in which it is impractical to differentiate carcinoma from cirrhosis of the liver. Microscopically, differentiation is made between primary liver cell and bile-duct types. In the present series, 39 were of the liver-cell type, 21 of the bile-duct type, and 2 were of indeterminate or dual origin. There were 53 cases in the white race, 4 in negroes, and 5 in the yellow race. The incidence in negroes parallels the admission rate of that race to Bellevue Hospital, but the incidence in the yellow race is considerably higher. The average age incidence was fifty-two and one-half years.

Clinically, the patients presented a history and symptoms of cirrhosis of the liver in 18 instances, and of disorders of the biliary or gastro-intestinal tracts in 14 instances. Also, in 14 patients there were signs of a malignant growth at some site in the body, characterized clinically by loss of weight, weakness, and the appearance of metastatic nodules. Three patients entered on the surgical services and died as a result of massive hemorrhages from ruptured nodules in the liver. Six others presented no signs or symptoms referable to pathological changes in the liver, and in the cases of 7, no clinical diagnosis was made.

The average course from the onset of symptoms to death was two and one-half months in the liver-cell type, and four and seventeen-hundredths months in the bile-duct type. Since the early symptoms are indefinite, the known time of onset of the more severe complaints was used as the criterion from which to estimate the onset of the disease. As to the cause, in 10 cases (9 of which were of the liver-cell type) indications of syphilis were present. In 22 cases an over-indulgence of alcohol was noted. Physical findings varied greatly. Many of the patients were emaciated, while others showed no physical changes. Jaundice was present in 32, it was mild, and more commonly present in the bile-duct type of carcinoma. Ascites was present in 28, and of equal incidence in both types. Hepatomegaly was noted in 44 cases. The liver was tender in 5 instances. Splenomegaly was noted once. Dependent edema was present in 8 cases. Fever, varying from 99 to 101 degrees F., was present in 29 cases.

At autopsy, the weight of the liver was mentioned in 48 of the 62 cases; the average was 2,900 gm. In 4 cases, it was referred to as "normal" or "small," while in 8 it was noted as "large." Metastases take place by direct extension and through the blood and lymph channels. In 19 cases, evidence of neoplastic venous thrombosis could be seen with the naked eye. The tumor thrombi were not adherent to the wall of the vessel, but were composed of organized and laminated blood clots containing strands and masses of tumor tissue. In 3 instances, bone metastases were present.

Only 7 of the 62 cases were diagnosed clinically. The diagnoses entertained most frequently were: carcinoma of the stomach with metastases to the liver, cirrhosis of the liver; carcinoma of the head of the pancreas, and secondary carcinoma of the liver and cardiac decompensation. Symmers has successfully made the clinical diagnosis in 7 instances on the following criteria: (1) a male patient over thirty-five years of age, (2) a large palpable tumor mass in the right lobe of the liver; (3) absence of primary tumors elsewhere, (4) jaundice of a mild grade, (5) ascites, and (6) a low grade fever of unexplainable origin.

An analysis of the 62 cases shows that all of them fulfill at least four, and in the majority of instances five or even all of the criteria.

MANUEL E. LICHTENSTEIN, M.D.



Fig. 3 Shows diagrammatically the cut end of the sigmoid telescoped into the rectal pouch. A few sutures connect the peritoneum of the sigmoid to the peritoneum covering the rectal pouch so that as the sigmoid is drawn down peritoneal surface becomes applied to peritoneal surface. A indicates ring of skin around artificial anus sutured to rubber tube. B slotted tube fixed in position with a safety pin used to keep the anastomosis in position and to drain the rectal pouch. C gauze and safety pin which prevent the tube from going up.

colon has been defunctioned, the lower the bacterial content is found to be and the better the local condition. In benign conditions such as a diverticular tumor or the complications arising from it operation may be delayed for twelve months. In malignant conditions the bowel cannot be defunctioned for more than a month.

Closure of the disconnected anus. The closure of the small disconnecting anus is very simple. A very long enterotome with a narrow almost cutting generally bevelled edge is used. Its length makes a very deep opening in the long spur. A connection can be made between the proximal and the distal segment in a few days (Fig. 2).

Types of operation. In the defunctioned distal colon which is quiescent, retracted and clean it is possible safely to perform an orthodox sutured anastomosis and it is still possible to do so even when the segments of bowel to be anastomosed are incompletely peritonealized or when the disparity in their caliber is great. The use of a sutured anastomosis in the case of carcinoma of the upper and lower parts of the sigmoid is of great advantage for the requisite amount of bowel which should be removed with the carcinoma and the proper amount of pertaining mesenteric leaf can be critically esti-

mated and then removed an advantage which does not obtain in operations on the principles of Paul Mikulicz and others. In growths in the lower third of the sigmoid this method of operating on the defunctioned colon is valuable. In this situation any operative methods based on the principle of Paul cannot be satisfactorily carried out because they do not permit an adequate resection of the mesenteric leaf and they do not allow sufficient removal of the bowel on the rectal side of the growth. When however the operation is carried out on a defunctioned bowel the proper amount of the sigmoid and upper part of the rectum with the corresponding part of the mesenteric leaf can be resected and with every prospect of success and very little danger the sigmoid can be anastomosed to the divided rectum. When the repair of this rectosigmoid anastomosis takes place in a defunctioned colon the incomplete peritonealization of the rectum does not mar the eventual successful healing of the anastomosis.

In some cases of rectosigmoid resection, a sutured anastomosis between the sigmoid and the stump of the rectum cannot be made because of mechanical disabilities. This happens in fat people, in male with narrow pelvis, and in patients with a small or short rectal stump. In circumstances such as these the rectal stump may be closed, the pericoreum sutured over it and the divided end of the sigmoid implanted into the abdominal wall. Then at a later stage when the peritoneum has become glued on to the rectum, the sigmoid may be disconnected and drawn through an opening which is made in this rectal pouch the sphincter of which is divided. As the sigmoid is functionless and the rectum patulous from the division of the sphincter and the anus is no more danger from this telescopic operation than from drawing the sigmoid on to the surface of the abdominal wall to make an ordinary abdominal artificial anus (Fig. 3).

The method is applicable particularly in serious cases of carcinoma of the lower end of the sigmoid. The telescopic anastomosis can be delayed for from six to twelve months when the patient will have greatly improved in health as a result of the removal of the malignant growth and when the circulation of the rectal stump, which is sometimes disturbed in these cases, will have improved.

MANUEL J. LICHTENSTEIN, M.D.

LIVER GALL BLADDER PANCREAS AND SPLEEN

Snell A. M. and Magath T. B. Tests for Liver Function. *J. Am. M. Ass.* 1935 110 167.

We have reviewed the theoretical basis, methods, limitations and interpretations of a series of tests for liver function in use at the Mayo Clinic. These are: (1) tests for serum bilirubin, (2) determinations of urobilin and urobilinogen, (3) tests depending on the general properties of the liver, with respect to protein metabolism, fat and cholesterol metabolism and carbohydrate metabolism, (4) tests of excretory

orders in the physiology of this organ usually lead to enlargement. These disorders have been grouped under the headings of circulatory disturbances, hyperactivity of its reticulo-endothelial cells, and increased activity in proliferation of either normal or neoplastic blood cells.

Since the year 1900, removal of the spleen has been advocated for numerous forms of splenomegaly, particularly for certain disturbances of the blood, congenital hemolytic anemia, splenic anemia, splenomegaly with gastric hemorrhages, purpura hemorrhagica, and for Gaucher's splenomegaly. The author's discussion is limited to five types of splenomegaly seen in children. For these, removal of the spleen was advocated. In the author's series of 52 splenectomies, there were 2 operative deaths, a mortality of 3.8 per cent.

Emphasis was placed on the greater severity of congenital hemolytic anemia in childhood, and on the need for early operative treatment to prevent fatal termination. The results of splenectomy in this disease were most gratifying. Particularly striking were the growth and development which were found to be retarded during the period of observation before operation. Platelet crises with intravascular thromboses may occur after splenectomy and cause serious symptoms.

Eight children with splenic anemia or leucopenic splenomegaly were operated on. In these cases the diagnosis was established by the exclusion of infections and by the finding of a moderate hypochromic anemia, a constant leucopenia, and a thrombocytopenia. In general the results of operative treatment in this group were fairly good, although not so satisfactory as in congenital hemolytic anemia.

Sixteen cases of splenomegaly with early gastric hemorrhage were studied. In 11 of these splenectomy was performed. The results were questionable, since hemorrhage tended to recur even after operation. As the probable lesion in such cases is thought to be an obstruction in the portal or splenic veins, removal of the spleen alone can hardly be expected to benefit all children with this disturbance. The additional procedure of tying the coronary vessels and performing an anastomosis between the omentum and peritoneum has seemed to result in less frequent hemorrhages.

In the study of a group of 28 cases with idiopathic thrombocytopenic purpura hemorrhagica, it was thought advisable to perform splenectomy in 8 cases. This was done to prevent fatal or serious recurrent hemorrhage, after the usual medical therapeutic agents had failed. In this group the operation gave moderate relief of the symptoms in 2 cases, and apparent complete relief in 6.

Five children with Gaucher's splenomegaly were treated by splenectomy. The indications for operation in this disease were: increasing fatigue and limitation of activity caused by the enlarging spleen, the development of hypochromic anemia with leucopenia and thrombocytopenia, and retardation of the growth and development of the child. In this group

the operation produced immediate relief from these troublesome symptoms. Although it still may be too early for a final appraisal of the state of the disease in each of these children, no extension to the skeletal system has been noted following splenectomy.

HOWARD A. McKNIGHT, M.D.

MISCELLANEOUS

Hochberg, L. A. • Subphrenic Abscess: A Review of 111 Cases and a Résumé of the Subject. *Arch Surg*, 1938, 36 111

The author reviews 111 cases of subphrenic abscess which were found over a twenty-year period, from 1916 to 1935, in 21,430 case records of the Jewish Hospital in Brooklyn, New York. A historical review of subphrenic abscess is given, together with a summary of the anatomy of the subphrenic areas. Table I shows the instance of subphrenic abscess in the cases reviewed, and Table II shows the location of the abscesses as they occurred in the various divisions of the subphrenic space in 90 of the author's patients. The organisms commonly found in the cases were the colon bacillus in 31.7 per cent, the staphylococcus in 31.7 per cent, the streptococcus in 30.2 per cent, and the pneumococcus in 5 per cent. More than one organism was present in approximately one-third of the cases.

The author believes that the mode of onset of subphrenic abscess is in one of three ways. (1) sudden, (2) insidious, and (3) postoperative. Fifteen per cent of the cases were included in his classification of "sudden onset." In such cases the abscess simulates a perforated ulcer with generalized peritonitis. Later, signs and symptoms of subphrenic abscess became manifest. The onset was insidious in 30 per cent of the cases reported. The symptom complex in these cases was subacute and simulated that of a chronic obscure intra-abdominal lesion. The signs of localization occurred gradually. Fifty-five per cent of the cases occurred in the postoperative group, and 70 per cent of all the cases started with symptoms referable to the abdomen, while the onset of symptoms in 25 per cent of the cases were referable to the lumbar region. The author stresses the value of roentgenograms taken in various positions. He believes that aspiration, as a diagnostic procedure, should not be done except at the time of operation.

When the extraperitoneal approach to a subphrenic abscess was carried out in 71 patients there were 6 deaths, or a mortality of 8.5 per cent. Of the 19 patients in whom the subserous route was used there were 10 deaths, or a mortality of 52.5 per cent. In the 111 cases studied there were 85 intrathoracic complications in 68 different patients. In the presence of intrathoracic complication the mortality was 32.4 per cent. There was a total mortality of 21.6 per cent in the 111 cases studied. Operation was carried out in 90 patients with a mortality of 17.6 per cent, and of the 21 patients in whom operation was not performed 8 died, a mortality of 38.4 per cent.

Mallet Guy P. Ascending Cholangitis Following Anastomosis of the Hepatic Duct with the Duodenum Its Treatment by Duodenal Exclusion Results Obtained After Seven Years (Angiocholite ascendante après hépato-duodénostomie Son traitement par l'exclusion duodénale Résultat sept ans après) *Mém Acad de chir* Par 1938 04 68

According to Mallet Guy several cases of ascending cholangitis following a bilio-enteric anastomosis have been reported in the literature. This author observed in 1933 the case of a forty five year old woman who originally underwent cholecystectomy for a calculous and suppurative cholangitis. About two months later a cholecystectomy was performed during which the common duct was inadvertently injured. The patency of the duct was ascertained and a tube was left in place. An ascending cholangitis developed with chills, fever, and icterus. Several months later the biliary fistula was closed by an anastomosis of the hepatic duct with the duodenum.

The wound healed by first intention but seven months later the patient developed a series of attacks characterized by icterus, chills, and fever. Believing that the biliary infection was due to a reflux of the intestinal contents through the anastomotic opening into the biliary tract, the author performed an extensive resection of the pyloric antrum and a posterior transmesocolic gastroenterostomy in order to exclude the duodenum.

The patient's condition improved after operation and she had only occasional attacks of icterus probably due to a slight hepatic insufficiency.

The patient was subsequently treated medically by the administration of pancreatic and hepatic extracts and with diathermy over the hepatic region. Her general condition improved but she complained of occasional attacks of jaundice especially after exercise or following exposure to cold. A blood count revealed a relative neutrophilic leucocytosis.

Seven years after the last operation the patient reported herself to be in excellent health except for the presence of a slight icterus which disappeared gradually. For the past year she has been completely asymptomatic.

In reviewing the literature on this subject the author concludes that an ascending cholangitis following anastomosis of the biliary tract to the digestive tract is due primarily to the suppression of sphincter action. The sphincter of Oddi usually prevents a reflux of the duodenal contents into the common duct. In the absence of a sphincter this reflux will set up an ascending infection as has been proven by animal experiments.

A series of other operations have been proposed in order to overcome this difficulty. It has been attempted to restore sphincter action by what has been called a plastic reconstruction of the biliary duct. At o cholechojejunostomies and a series of other operations have been performed.

The author believes however, that the operation described above is the simplest and safest and should be used in cases in which the patient's condition does not improve following a bilio enteric anastomosis.

RICHARD E. SOMMA, M.D.

Elision E. L. and Johnson J. Splenectomy *Surgery* 1937 2 823

The authors report a series of 53 splenectomies. There were 21 cases of splenic anemia (Banti's disease). Among these there were 8 deaths all occurring in patients with advanced disease. On the basis of this experience the authors believe that operation is justified in the late stage only when the size of the spleen causes great discomfort. Of the 13 surviving patients all but one are either well or their condition is improved.

There were 12 cases of hemolytic icterus. There was no operative mortality and all but one of the patients are well. It is preferable in this disease to perform splenectomy during a remission but occasionally operation is necessary during an acute exacerbation.

Seven patients presented purpura hemorrhagica. There were no operative deaths. Operation should be performed both in the acute and chronic cases if bleeding does not respond promptly to conservative measures.

There were 5 patients with rupture of the spleen all of whom recovered from the operation and are well after from one to eleven years follow up.

Splenectomy was performed on 2 patients suffering from subacute bacterial endocarditis with splenomegaly. One died and the other was not followed up. Reesman and his co-workers believe that splenectomy for this condition prolongs life and renders the patient more comfortable.

Multiple lymphogenous cysts were diagnosed in 2 patients. Both recovered and are well following operation.

Splenectomy was performed in 1 case of syphilis associated with splenomegaly. The patient prior to operation, failed to respond to anti-luetic therapy but thereafter responded well.

Operation was performed in 1 case of primary splenic tuberculosis with an excellent result. It also was performed in 1 case of myelogenous leukemia. This patient died three months after operation. In 1 case of aplastic anemia associated with purpura splenectomy was performed as a last resort. The patient died on the eighth postoperative day.

The authors discuss the technique of splenectomy and give an extensive bibliography.

ARTHUR S. W. TOLKOFF, M.D.

Diamond L. A. Indications for Splenectomy in Childhood Results in 52 Operated Cases *Am J Surg* 1938 39 400

In a brief review of the known functions of the spleen its importance in the maintenance and prevention of disease has been pointed out. The dis-

GYNECOLOGY

UTERUS

Young, J : Lower Abdominal Pains of Cervical Origin. *Brit M J*, 1938, 1 105

For many years Young and his co-workers have been concerned with the cervix as a cause of lower abdominal pain; their attention was first directed to this problem because of a group of their patients with chronic lower abdominal distress for whom no satisfactory treatment seemed available since they presented so little genital disease. These patients are now classified as presenting the cervical syndrome, which is characterized by the following features

The condition is almost restricted to parous women and the symptoms usually date from an abortion or a confinement. The chief complaints are chronic distress and pain in the lower abdomen, and, less frequently, in the lumbosacral area of the back. Dyspareunia is usually present. Some degree of cervicitis with more or less intensive leucorrhoea is a constant feature, the absence of gross pelvic disease, in the face of such marked symptoms, may give rise to considerable confusion in the diagnosis. In a large proportion of cases, treatment of a simple nature and directed toward the underlying lesion in the cervix is strikingly successful.

In the past little attention has been accorded the diseased cervix as a source of chronic abdominopelvic pain because: (1) cervical trauma and infection may be painless, (2) the healthy cervix is insensitive to stimuli which produce pain on surface tissues, and (3) pain may persist after the entire uterus has been removed.

Hollow intraperitoneal viscera which are mesially situated may, when diseased, cause either true visceral pain or referred, or reflex, pain. Visceral sensations are typically if not always mesial in location. They are poorly localized by the patient and they are not associated with hyperalgesia and muscular rigidity of the corresponding part of the abdominal wall. Referred pains are felt on the body surface at a site which, in general, is determined by the location of the organ, typically they are associated with hyperalgesia and muscular rigidity, therefore they are well localized. It is generally agreed that true visceral pain is felt directly in the organ through the medium of the splanchnic nerves, but referred pain, with its associated hyperalgesia, muscular rigidity, and tenderness, is dependent on impulses derived from an irritation of the adjacent peritoneum. Thus the site of referred pain depends upon the site of the peritoneal irritation.

The dominating symptom in the cervical syndrome is abdominal pain. In some cases the pain and tenderness may be widespread over the abdomen but in most cases they are restricted to the lower abdomen.

Mesial visceral pain does not ordinarily constitute the main symptom. It may appear in two forms

(1) a spontaneous discomfort or actual pain vaguely located behind the pubis or in the lower midabdomen; it is not associated with either hyperalgesia, muscular rigidity, or local tenderness on pressure, (2) a pain felt immediately when the examining finger exerts pressure against the cervix. Such pain, initiated by pressure on the cervix, is called visceral excitation pain. It is recognized that both spontaneous and excitation pains may be absent, this is true especially if the inflammation in the cervix is limited to the pars vaginalis. In those patients with excitation pain, dyspareunia is a characteristic symptom and Young believes that inflammation of the cervix is the most common cause of dyspareunia in parous women.

In many patients referred pain in the iliac fossa is the most prominent symptom. It may be bilateral but is usually unilateral, and is much more frequent on the left side. It may be a spontaneous pain, local tenderness, or a well localized excitation pain. The spontaneous pain may consist of a constant aching, or it may come and go. It may be widespread over the lower lateral quadrant or it may be more localized. It is associated with local tenderness. In many patients it is restricted to an area about 2 in. square, just below and lateral to the umbilicus. Usually there is an associated hyperalgesia of the skin. Pressure on the cervix may excite an acute and well localized pain in this area, this is referred excitation pain.

The routine care of these women formerly consisted of dilatation of the cervix, radial incision of the infected area with the electric cautery, and deep puncture of the tissues including evacuation of gland cysts. This yielded a cure, or partial relief, in 80 per cent of the patients. However, since there was a considerable proportion who obtained little or no relief, the author added to his previous routine injections of various substances into the broad ligament for blockage of Frankenhaeuser's plexus. He first used 85 per cent alcohol and although immediate relief was obtained in a large number of patients, in many it was only a temporary improvement. More recently he has used procaine for these injections and this seems to be more helpful than alcohol. At present the routine management includes treatment directed at cervical drainage combined with nerve blockage. Many of these women also note that a prompt reduction of the bladder irritability takes place.

Not all cases are cured. There is still a small group which fail to respond to this type of treatment and there is a considerable group in which the response is only temporary. In some, relief may be obtained from hysterectomy. Presacral neurectomy has not proved helpful.

Pain in the lumbosacral area is frequent in the cervical syndrome. From the standpoint of etiology,

TABLE I—STATISTICAL RESUME AND THE INCIDENCE OF SUBPHRENIC ABSCESSSES IN CASES OF INTRA ABDOMINAL CONDITIONS IN WHICH OPERATION WAS PERFORMED

Patients and Conditions and Operations	Number of Cases 1916-1932	Number and Percentage of Subphrenic Abscesses
Diseases of the peritoneum		
Appendicitis without drainage	22 55%	30 43%
Appendicitis with drainage		3 0%
Drainage without appendectomy		3 0%
Diseases of the biliary passage	2 67%	35 100%
Cholecystectomy		7 21%
Cholecystectomy with prophylactic appendectomy		1,319 37%
Cholecystectomy with or without cholecystectomy		107 3%
Cholecystectomy with or without cholecystectomy		226 3%
Diseases of the liver	50	5 10%
Infection and drainage of abscess of the liver		5 10%
Diseases of the stomach and esophagus	604	5 0%
Suture of perforated gastric ulcer		64 1%
Gastro-enterostomy for gastric ulcer		265 0%
Gastrostomy for gastric and esophageal growth		671 1%
Gastrostomy for carcinoma of stomach		3 0%
Gastro-enterostomy for small intestine growth		1 0%
Diseases of the pylorus and duodenum	232	1 0%
Ramstedt's pyloroplasty		114 0%
Gastro-enterostomy for duodenal ulcer		4 5%
Suture of perforated duodenal ulcer		52 2%
Diseases of the intestines	306	2 0%
Enterostomy with relief of obstructing adhesion		112 0%
Enterostomy for stenosis of ileum		436 0%
Suture of ruptured intestine		33 1%
Resection of intestine		55 0%
Cholecystectomy		62 0%
Diseases of the rectum and sigmoid	674	0
Resection for carcinoma of the rectum and sigmoid		674 0%
Diseases of the pelvis	478	8 1%
Salpingitis		368 7%
Salpingitis		34 0%
Perinephric abscess—incision and drainage	50	0
Exploratory laparotomy without drainage	116	0
Exploratory laparotomy with drainage of intraperitoneal abscess of unknown origin	25	1 4%
Infection and drainage of abscess of the abdominal wall	44	1 3%

TABLE II—SOURCE OF INFECTION OF THE VARIOUS DIVISIONS OF THE SUBPHRENIC SPACE AND THE INCIDENCE OF THESE INFECTIONS IN 90 OF THE AUTHOR'S CASES

Location	Etiology	Number of Cases	Percentage
Right posterior subphrenic space	Right diaphragm and pleura, pyloroduodenal region, paracolic gutter, draining appendix, cecum, pelvis, etc.	18	100%
Right anterior subphrenic space	Right diaphragm and pleura, pyloroduodenal region, gall bladder, liver, gall bladder, and biliary ducts, hepatic flexure of colon, pyloroduodenal region, right posterior subphrenic space, gastro-esophageal region	14	43%
Right lateral subphrenic space	Right diaphragm and pleura, pyloroduodenal region, gall bladder, liver, gall bladder, and biliary ducts, hepatic flexure of colon, pyloroduodenal region, right posterior subphrenic space, gastro-esophageal region	32	55%
Left anterior subphrenic space	Left diaphragm and pleura, pylorus, stomach, liver, and spleen	2	1%
Left posterior subphrenic space	Left diaphragm and pleura, pylorus, stomach, liver, and spleen	5	3%
Left lateral subphrenic space	Left diaphragm and pleura, pylorus, stomach, liver, and spleen	4	4%
Right posterior subphrenic space	Right diaphragm and pleura, pylorus, stomach, liver, and spleen	5	5%
Right anterior subphrenic space	Right diaphragm and pleura, pylorus, stomach, liver, and spleen	4	4%
Right lateral subphrenic space	Right diaphragm and pleura, pylorus, stomach, liver, and spleen	4	4%
Left anterior subphrenic space	Left diaphragm and pleura, pylorus, stomach, liver, and spleen	4	4%
Left posterior subphrenic space	Left diaphragm and pleura, pylorus, stomach, liver, and spleen	4	4%
Left lateral subphrenic space	Left diaphragm and pleura, pylorus, stomach, liver, and spleen	4	4%

*In 34 cases we could not classify the infection involved both the right intrahepatic and the right posterior subphrenic space.

Drawings are included in the original article to demonstrate the ideal extraperitoneal route which is suitable to most cases of subphrenic abscess. In the past ten years the mortality following the lower

extraperitoneal route was only 7 per cent whereas in that same period the mortality following operation by the transperitoneal route was 32.5 per cent.

ROBERT ZOLLINGER, M.D.

ment may be hoped for. A survey of the 6 statistical reports of their results shows an improvement in the relative five-year cure rates they have obtained as follows. 1925, 23.6 per cent; 1928, 23.1 per cent, 1930, 25.5 per cent, 1932, 24.8 per cent, 1934, 25.28 per cent, and 1937, 28.5 per cent.

ANTHONY F. SAVA, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Daniel, C., and Goldenberg-Bayler, S.: Vaccine Therapy in Adnexitis with Metrorrhagia (La vaccinothérapie dans les annexites métrorragiques) *Rev franç de gynéc et d'obst*, 1938, 33:1

Daniel and Goldenberg-Bayler state that both textbooks on gynecology and recent reports from various clinics note the occurrence of both menorrhagia and metrorrhagia in association with inflammatory disease of the adnexa. At Daniel's clinic in Bucharest, Roumania, in 1926, 51 per cent of cases of adnexitis due to puerperal or gonorrheal infection in the acute stage, and 50 per cent in the chronic stage presented menorrhagia and metrorrhagia.

Salpingo-ovaritis with uterine bleeding due to tuberculous or syphilitic infection requires special treatment. In this report only inflammatory lesions due to other micro-organisms are included. The mechanism of the production of uterine hemorrhage in adnexitis is not well understood. It may be due to involvement of the uterine mucosa, or it may be of ovarian origin. The fact that in some cases curettage shows that the uterine mucosa is not necessarily congested and inflamed indicates that in such cases, at least, the bleeding is of ovarian origin. In one of the authors' cases the uterine mucosa was thin and showed but little inflammatory change. Often curettage does not stop the bleeding for any length of time.

The severity of the uterine bleeding is not always parallel to the extent of the lesions. Of the authors' 24 cases, 11 showed cystic lesions, while the remaining 13 showed only inflammatory lesions. The bleeding may be of the menorrhagia type, occurring only at the menstrual periods, or of the metrorrhagia type, in some cases both types are found. The bleeding was menorrhagic in 8 cases of the authors' 24 cases, metrorrhagic in 12, and meno-metrorrhagic in 4. There were 8 acute and 16 chronic cases, with the metrorrhagic type of bleeding predominating in both groups.

When vaccine therapy was first employed in the treatment of salpingo-ovaritis, it was used but seldom and then very conservatively in cases with uterine hemorrhage, but more recently it has been employed more widely in hemorrhagic cases and with good results. In cases in which the infection is of puerperal origin, Delbet's vaccine is used by intramuscular injection. In non-puerperal cases in which gonococcal infection is proved or suspected an antigonococcus vaccine is used and is given by subcutaneous injection. The dosage employed varies

with each case. Small doses are given at first, so that they may be increased and spaced according to the patient's reaction.

The bleeding ceased entirely after the first few injections, from six to eight, in 22 of the 24 cases reported. In 1 case rupture of a pyosalpinx occurred which necessitated an emergency operation, in the other the bleeding diminished, but did not cease entirely. In the latter case the Delbet vaccine alone was used although the patient was a nullipara.

In most cases there was a favorable change in the physical signs of the adnexal lesions. In 7 cases they disappeared completely and in 14 they showed a marked regression.

In addition to its therapeutic value in adnexal inflammation, vaccine therapy has a diagnostic value in differentiating inflammatory lesions from ectopic gestation. If the lesions regress and the hemorrhage is relieved following treatment with vaccine, it indicates the presence of an inflammatory lesion.

In cases of uterine bleeding resistant to treatment, the possibility of an adnexitis should be considered, as such a lesion, even if of slight degree, may cause the bleeding. If adnexitis is found, the authors believe that vaccine therapy is the method of choice.

ALICE M. MEYERS

Westman, A.: The Action of Gonadotropic Hormones of the Anterior Lobe of the Hypophysis, Antex, on Human Ovaries (Untersuchungen ueber die Wirkung des gonadotropen Hypophysenvorderlappenhormones, Antex, auf die Ovarien der Frau) *Acta obst et gynec Scand*, 1937, 17:492

The views held on the action of the gonadotropic hormones on human ovaries have been varied. With prolactin, or chorionic hormone, no maturation of the follicles seems to be obtained, but in certain cases processes of luteinization are found to occur.

Engle and Hamburger have shown that with gonadotropic hormone, antex, it is possible to obtain follicular growth in the ovaries of the ape. In the present work the author has studied the effect of antex on human ovaries.

Patients who for some reason or other have been laparotomized were treated pre-operatively with antex in relatively large doses, averaging from 9,000 to 10,000 mouse units. Later, the ovaries were analyzed histologically.

The material was divided into two groups: (1) patients presenting healthy genital organs, after sterilization operation or with psychosis, and (2) patients with myoma.

Group 1 comprised 7 patients. Three were operated on during the normal menstruation cycle, 1 during pregnancy to induce abortion, and 3 during the early puerperium. In all, the follicles showed a strongly increased growth. Of particular interest was the fact that this proved to be the case during pregnancy and the puerperium, as under normal conditions the processes of follicular maturation are inhibited.

the author divides backaches into three groups in some cases they are due to genital prolapse or some other major pelvic disease in others they are an orthopedic problem and finally there are some with out evidence of joint disease and no gross pelvic pathology except the cervical syndrome. In this latter group procaine blockage of the pelvic nerves often leads to relief from symptoms.

Differential diagnosis. The absence of gross pelvic and abdominal disease along with the puerperal correlation usually suffices to distinguish the cervical syndrome from the major causes of lower abdominal pain such as neoplasm, endometriosis, diverticulitis and appendicitis. **GEORGE H. GARDNER, M.D.**

Scheffey, L. C. and Thudtum, W. J. Experience in the Treatment of Carcinoma of the Fundus of the Uterus with Five Year End Results in 47 Patients. *Am. J. Obst. & Gynec.* 1937 34 1006

Four of 5 women with carcinoma of the fundus developed it after the age of fifty. In 3 of the 4 it was postmenopausal in onset. Irregular uterine bleeding was the predominant symptom. Discharge and pain were of minor diagnostic significance.

The advantage of diagnostic curettage outweighs its potentiality to do harm. This is true especially in the case of those patients who may develop carcinoma prior to the menopause when a more obvious pathological condition, notably fibromyoma uteri may appear to be the predominant lesion.

Carcinoma of the fundus should be graded as to its degree of malignancy but as simply as possible. While the folly of attempting to base a prognosis entirely on the gradation of the cell type of growth is obvious, it is plausible to believe that careful consideration of the stage of differentiation of the tumor cells together with the clinical features of the case is of distinct value in planning treatment and evaluating the chance of survival.

The best results regardless of the type of treatment were obtained in the cases of low grade malignancy. Radiation alone gave the best end results when all of the cases were considered and was particularly efficacious in the cases of intermediate and high grade malignancy. When surgery was employed the results were better if it was combined with radiation.

The ultimate prognosis depends upon factors other than the grade of malignancy. Primarily these factors are clinical and relate to the age and physical condition of the patient, the duration of the symptoms, the promptness of the diagnosis and the extent of the disease. Secondly they relate to the treatment.

Each patient with carcinoma of the fundus presents an individual problem in treatment, the management of which depends upon a thoughtful evaluation of all the factors concerned and no standard advised plan of therapy can be offered.

Of 47 patients seen 46 were treated. Twelve are alive and present no demonstrable evidence of recurrent carcinoma the periods after treatment

range from five to thirteen years and the present ages of the patients vary from fifty four to seventy seven years. Therefore the present day absolute cure is 25.5 per cent and the relative cure is 26 per cent. Three additional patients survived from five to eight years but clinically they did not die of carcinoma; this increased the five-year absolute survival to 31.9 per cent and the relative survival to 32.6 per cent. Three patients who survived from six to seven years after treatment but died of carcinoma increased the absolute five year survival to 38 per cent and the relative survival to 30.1 per cent but this is solely of theoretical interest. Twenty nine patients including the one who was untreated died of cancer within five years of treatment most of them within a year. There were 2 postoperative deaths, a primary mortality for the entire series of 4.3 per cent or 8.6 per cent for the patients subjected to hysterectomy.

EDWARD L. CORNELL, M.D.

Ward, G. G. and Sackett, N. B. Results of Radiation Therapy for Carcinoma of the Uterus. *J. Am. W. Ass.* 1938 110 345

During the eighteen years in which the authors have been treating carcinoma of the cervix with radium at the Woman's Hospital, New York City, they have obtained five year survivals in 27.4 per cent of the 595 patients seen and 28.3 per cent of the patients treated. In the cases of early carcinoma in which the disease was limited to the cervix they saved 56.2 per cent of the patients which shows the importance of treating the disease in the beginning stages.

For the 350 patients seen over a period of ten years the rate of absolute cure was 17.3 per cent and the relative rate was 18 per cent. In spite of lowered life expectancy, 73 per cent of those who survived five years lived ten years or longer.

The authors believe that in determining the probability of cure the extent of the disease is of greater importance than the type of cell. In their series cases of early carcinoma were cured twice as often as those of advanced carcinoma irrespective of the maturity of the cells and of whether they were of the squamous or adenocarcinomatous type.

The high incidence of carcinoma of the stump after supravaginal hysterectomy points to the desirability of panhysterectomy whenever possible if no added risk is involved. In 103 cases of carcinoma of the fundus an absolute five year cure of 42.6 per cent and a relative cure of 45.5 per cent were obtained. A panhysterectomy therefore is the most essential part of the treatment of carcinoma of the corpus and should be employed whenever possible. Combined radiotherapy and hysterectomy seems to be the most promising method. However surgical intervention is contra indicated in nearly 50 per cent of the cases and radiotherapy is the only recourse for this group.

With the adoption of the Coutard fractional technique the authors believe that definite improve

tain the same cycle that existed before the oophorectomy. The majority of the patients with a new regular cycle, as well as those in whom an irregular cycle became regular, were between thirty and thirty-five years of age. In patients more than thirty-five years of age the cycle usually became more irregular. It was clear that in the human being the taking over of the entire ovarian function by one ovary was not easily accomplished. The cases with unilateral adnexal defects previously reviewed by the author showed that the body which has but one ovary from birth adjusts itself much better to this short-coming than the one in which an ovary is removed later in life.

In the second part of the article the author discusses the fertility of the individual after removal of one ovary and showed that it was decreased after the operation, even though in a large number of cases the factors which disturb fertility, like tumors, were removed. It was evident that one-sided oophorectomy influenced the fertility much less in the young individual than in one of more advanced age. After the age of thirty there is a sudden definite drop in the number of children borne, for which fact, in addition to birth control, the decreased function of the ovary must be held responsible. It cannot be blamed on the lack of sufficient ova maturing from the remaining ovary but on the disturbance of the hormonal balance following the removal of one ovary, which is also responsible for the changed menstrual cycle. The surprising fact that the entire number of pregnancies after operation is comparatively greater than the number occurring in women whose regular menstrual cycle was unchanged after the operation suggests that it is difficult to maintain a lasting possibility of pregnancy, whereas the transient condition may suffice for one pregnancy after the operation.

As a result of the foregoing investigations the author believes that a conservative attitude should always be maintained regarding the removal of an ovary, especially if the patient has menstruated regularly, and if the patient is young. A young patient demands an ovarian function lasting for a good many years. In the older woman, more than thirty-five years of age, careful consideration is also necessary as the ovarian function has a tendency to cease after removal of one ovary.

LEO A. JUHNKE, M.D.

EXTERNAL GENITALIA

Ward, G. E.: Ox Fascia Lata for Reconstruction of Round Ligaments in Correcting Prolapse of the Vagina. *Arch Surg*, 1938, 36 163

The author describes an operation for the suspension of the prolapsed vaginal vault following pan-hysterectomy. It consists of the reconstruction of round ligaments out of preserved fascia lata of the ox and the continuation of the newly made ligaments anteriorly under the peritoneum of the bladder to give added support to that organ. He believes that

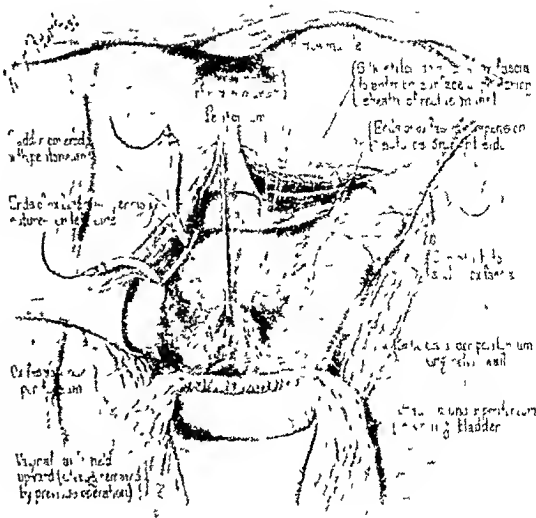


Fig 1. Suspension of vault of vagina. Koontz' fascia used. Method of placing ox fascia suspension sutures to draw and hold vault of vagina upward.

building new round ligaments is more physiological than too much mutilation of the vagina.

A case is reported in which successful results have been maintained for four years.

CHARLES BARON, M.D.

Nuytten, J., and Garraud, R.: The Value of Radium Therapy in the Treatment of Cancer of the Vulva (Valeur de la curietherapie dans le traitement du cancer de la vulve). *Gynec et obst*, 1937, 36 508

The authors report 17 cases of carcinoma of the vulva which were treated by various methods of radium therapy. They draw the following conclusions:

1. Radium therapy gives excellent results in vulvar carcinoma. Even when in advanced stages of the condition, 50 per cent of their patients were markedly benefited by it, and 25 per cent were permanently cured.

2. Inguinal adenopathy is the key to the prognosis. In the absence of adenopathy the chances of cure are excellent. In the presence of adenopathy, even after bilateral resection of the glands or heavy irradiation, recurrence is frequent.

3. Interstitial radium therapy is the method of choice in the management of cancers involving the labia majora, labia minora, fourchette, or clitoris. A radium tampon placed in the vagina is the method of treatment used in carcinoma of the meatus.

4. Telecurietherapie should be reserved for cases too extensive to permit the interstitial application of radium. In such instances, telecurietherapie offers the only chance of cure or amelioration.

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Group 2 comprised 7 patients with myoma. Five of these showed a strong growth of the follicles. In 1 who had been treated with an essentially weaker dosage than the others no effect was observed. The last mentioned patient had been treated both with anter and with physer or chorionic hormone. She presented 3 fresh corpora lutea. No increased luteinization was observed in the other patients.

The effect of anter on the human ovaries strongly resembles that on the ovaries of the ape.

In all the cases the effect was obtained in ovaries capable of function. Whether a similar effect is obtainable in ovaries during pathological conditions, as in primary and secondary amenorrhea is now being tested.

McIlraith M B. Fibroma of the Ovary. A Clinical Study. *J Obst & Gynec Brit Emp* 1937, 44: 2102.

A case of fibroma of the ovary in a thirty five year old woman is reported together with 30 other cases occurring at the St Mary's Hospital, Manchester, and a series of 21 cases collected from the literature. The frequency of this condition has been reported as from 6 in 4,500 specimens to 5.9 per cent of 555 ovarian tumors.

The condition is most common at the menopause and in this series multiparas were chiefly affected. Menstrual disturbances may occur such as menorrhagia, dysmenorrhea, changes in rhythm and amenorrhea, their frequency being in the order given the most frequent condition being first. A bloody discharge may occur in those patients who are past the menopause. Pain is a common symptom and may be localized in the pelvis, side, abdomen, leg and back. Sometimes torsion occurs and produces acute pain. Abdominal swelling is a common feature and is due either to the tumor mass or to ascites. The latter was present in about one fifth of the cases. The tumor was on the left side more frequently than on the right. Pressure symptoms are common, urinary frequency and constipation being especially frequent. The rôle played by degenerative changes in the production of pain is difficult to ascertain but such changes seem to play a smaller part in fibroma of the ovary than in uterine fibroids.

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Heisberg B. The Excretion of Gonadotropic Hormones in the Urine after Autotransplantation of the Ovary (Die Ausscheidung Gonadotropen Hormone im Urin nach Ovarien Autotransplantation bei Frauen). *Acta obst & gynec Scand* 1937, 17: 440.

When the amount of gonadotropic hormone in the urine is increased beyond fairly low values it is as a rule a sign of decreased function of the ovaries. The quantity of gonadotropic hormone secreted into the urine was examined in the cases of 5 women on whom a gynecological laparotomy was performed with castration and autotransplantation of ovarian tissue.

Upon examination the secretory conditions on the whole were the same. For several weeks after the

operation no increase in the hormonal secretion could be observed. This was presumably the result of the transplanted tissue. Then followed a period of a couple of months in which increased quantities of gonadotropic hormone, corresponding to a decreased function of the transplanted tissue were observed. The latter had not yet adhered sufficiently. After this followed a long period, lasting several months, during which the urine did not contain increased quantities of the hormone. This proved that the transplanted tissue had taken hold and was functioning in the manner of normal ovarian tissue. Finally, in all the 5 patients increased quantities of gonadotropic hormone appeared in the urine which indicated that the power of function of the transplanted tissue was decreasing. The menopause was presumably setting in.

The clinical symptoms of the function of the ovary and the secretion of gonadotropic hormone in the urine showed that there was a relationship between the two.

The technique of the determination of the gonadotropic hormone is described.

Caffier P. The Removal of One Ovary and its Consequences (Die einseitige Eierstockentfernung und ihre Folgen). *Zentralbl f Gynaek* 1937, p 2370.

In this article the author discusses first the changes in the cycle following oophorectomy on one side and describes them as follows:

1. The interval, severity and duration of the cycle remained the same as before the operation in 31.6 per cent of the cases.

2. The tempo was retained but the severity and the duration were changed in 23 per cent.

3. In place of the previous regular cycle a new regular cycle with a longer or shorter interval occurred in 5.2 per cent.

4. The previously regular cycle became completely irregular or presented at least considerable variations in 17.2 per cent.

5. The previously irregular period remained so after the operation in 9.8 per cent.

6. The previously irregular period became regular after the operation with the disappearance of all difficulties or symptoms in 12.1 per cent.

He emphasizes the fact that even after oophorectomy on one side hyperplasia of the uterine mucosa can occur, and that even only one ovary may produce enough follicle hormone. In view of the investigations of Wahl and Fueth who stated that regular periods with a short interval denote a high grade of vitality and generative ability the author paid special attention to the periods of the women with oophorectomy on one side and believes that they also fare well in this respect. In reviewing the different age groups he comes to the conclusion that no definite change of the cycle can be attributed to one group or another but the following statements may be made:

In patients between twenty five and thirty years of age there seemed to be a definite tendency to re-

rate extremely high but the maternal mortality equals or exceeds that of any fairly frequent complication of pregnancy. Bartholomew divides his cases into the severe, 24.6 per cent, the moderate, 11.4 per cent, and the mild, 64 per cent, and again, into those in which the hemorrhage is external and those in which it is concealed. Beavers classifies his as external, concealed, or those with uteroplacental apoplexy, and Polak as non-tragic and tragic. Believing that the presence of blood retained within the uterus is of more importance with regard to a fatal outcome than the coexistence of toxemia, Irving classifies his cases as those with external hemorrhage, 66.3 per cent and those with internal hemorrhage, 33.7 per cent. Dieckmann describes all cases as either toxemic or non-toxemic, and O'Connor as toxemic-chronic nephritic, of uterine or ovular origin, and of traumatic origin.

Ethology Balizfalvy states that 53 per cent of his patients were over thirty years of age, and Polak sets the period between twenty-five and thirty-five as the time when premature separation is most likely to occur. Fifty per cent of Balizfalvy's patients were multiparæ, as were 67.5 per cent of those observed by Burgess. Seventy-one per cent of Stroink's patients had not reached full term and most of Balizfalvy's patients were in the last half of pregnancy.

A relationship between toxemia and premature separation of the placenta has been noted by a number of authors. Bartholomew found toxemia present in 52.5 per cent of his cases, Burgess in 20, Goethals in 24.2, Gordon in 34, Katsu in 62, Montgomery in 56.1, O'Connor in 89.2, Surala in 58, and Robinson in 50. Goethals found that premature separation of the placenta occurred in one of every 22 cases of toxemia. De Snoo says that the condition appears most frequently in older women who have borne a number of children and who suffer from disease of the blood vessels. Sixteen per cent of his patients had chronic nephritis. Polak believed chronic nephritis to be the most common predisposing factor. Goethals reported that 4.7 per cent of his patients had eclampsia. On the other hand, Beavers, quoting Goodell and Holmes, calls attention to the relative infrequency of convulsions, which occurred in only 4 of their 306 cases. Paramore does not believe that premature separation is caused by toxemia. He thinks that rupture of the placental sinuses is caused by increased blood pressure.

Trauma plays a relatively unimportant rôle. Gordon reported 4.6 per cent of such cases, while Katsu noted it as an etiological factor in 10 per cent, and Montgomery in 12.5 per cent. Picardi,

quoting Micheli, reports 165 cases of trauma, in 120 of which the trauma had directly affected the abdomen, without a single instance of premature detachment. Brochier and Luikart each describe cases occurring after attempts at external version, and Robinson and Lucchetti one each after the administration of pituitary extract. Guirauden reports a case that he believed was caused by a short umbilical cord, and Procopio one occurring in a woman who was kicked and beaten by her husband. Siirala notes a relationship between premature separation of the placenta and respiratory infections and believes it to be more common during the winter and spring. Rosenfeld reports a case which resulted from an abscess of the placenta containing gram-positive cocci. Autopsy on the infant was negative. Guroy and Adamo believe that hyperthyroidism may be a predisposing factor and Klein notes a connection with measles. Picardi reports 3 cases resulting from carbon-disulphide poisoning among workers in artificial silk. Bartholomew found the incidence of twins in this condition to be 1 to 10, Burgess 1 to 40 and Heim 1 to 38, all considerable increases over the normal frequency. Balasquide reports a case of dizygotic twins. One placenta was separated and the corresponding infant was dead. The other twin was living. Its placenta was attached.

Pathology Aside from the coagula and fluid blood mixed with liquor amni which are expelled following the birth of the fetus, the presence of clots adherent to the placenta, especially at the marginal portion, is noted by many observers. Depressed areas in the placenta underlying the clots are of frequent occurrence. Hertig calls attention to the presence of developmental abnormalities, such as placenta circumvallata and velamentous insertion of the cord, in two-thirds of cases, and infarcts, either red or white, in one-third. Bartholomew also mentions the prevalence of infarction in this condition. On the other hand, Montgomery believes that infarcts are no more frequent than in normal placenta. He thinks that hemorrhages from the decidual sinuses indent the maternal surface of the after-birth and compress the surrounding chorionic villi, which leads to the formation of a pseudo-capsule. Since this mechanism has long been considered to be one of several which result in the formation of infarcts, such a difference of opinion appears to be largely one of terminology. Stroink maintains that there are two systems of blood vessels in the myometrium: the small nutrient arteries and veins, and the large, thin-walled sinuses which supply the placental site. Infarcts

PREMATURE SEPARATION OF THE NORMALLY IMPLANTED PLACENTA

Collective Review

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WHEN the normally situated after birth becomes detached from its site at any time between the twenty eighth week of pregnancy and the third stage of labor it is known as premature separation of the placenta *ablatio placentae*, or *abruptio placentae*. The term 'accidental hemorrhage' used by British authors is inapt since it suggests accident, or trauma, which rarely is a cause. Cases occurring earlier than the twenty eighth week are more properly classed as miscarriages although hemorrhage is often present and is due also to bleeding from the placental site. Low attachment of the placenta accompanied by hemorrhage is sometimes called 'premature separation', but if on vaginal examination the after birth can be reached by the examining finger it is better considered as marginal placenta previa.

History. In the last twelve years Balzifalvy, Bausweiler, Kellogg, Phaneuf, and Troupin have recalled important chronological landmarks in the development of our knowledge of this condition. It was distinguished from placenta previa by Rigby in 1776. In 1834 White described the characteristic mottled appearance of the uterine surface in a specimen removed at autopsy although he was unaware of its significance. Goodell in 1875 collected 106 cases from the literature and called attention to its high mortality. In 1881, Chantreuil first noted the connection between premature separation and albuminuria and in 1898 Kouver described peritoneal bleeding from a fissure on the surface of the uterus. Tarbett in 1905 performed the first cesarean section followed by hysterectomy and LeLoner in 1906 the first conservative cesarean. In 1912 Couvelaire presented his classic description of hemorrhage and edema occurring in the uterine wall to which he applied the term *uteroplacental apoplexy*. Holmes in 1901 reported 200 collected cases and suggested the name *ablatio placentae* for the severe type with sudden onset in which the greater part of the hemorrhage is retained within the uterus.

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From the historical point of view the most important woman ever afflicted with this disease was the Princess Charlotte, daughter of George IV of England in whom retarded the hope of the Hanoverian dynasty. Goodell tells us that in 1817 she suffered from an internal hemorrhage and was in labor fifty two hours. Her child was stillborn and she succumbed six hours later. Her accoucheur, Sir Richard Croft, shot himself. The only survivor of the tragedy was her husband Prince Leopold; he lived until 1865.

Bibliography. The most complete bibliography is that of Phaneuf compiled in 1925. The reviewer hopes that the references appended to this article covering the literature from 1925 to 1938 will be found sufficiently inclusive to bring the subject up to date.

Frequency. Statements regarding the frequency of premature separation of the placenta vary from that of Goethals 1 in 94 deliveries to that of Kraus, 1 in 555. Robinson found it to be 1 in 121, Bartholomen and Clauberg each reported 1 in 150. Polak 1 in 200, Smith 1 in 228, Burgess 1 in 234, Katsu 1 in 246, Davis 1 in 254, Mostgomery 1 in 265, Gordon 1 in 300, Heim 1 in 27 and Nicholls 1 in 350. The average of the figures is 1 in 248. Shute believes that cases of mild or severe retroplacental hemorrhage outnumber those of eclampsia as much as 105 to 11. The frequency with which premature separation occurs in the experience of different authors is governed greatly by the type of clinic from which their material is drawn. Hospitals conducting emergency services will treat many more such cases than will be found in institutions receiving only private or registered patients. Moreover, accuracy of diagnosis has a considerable bearing upon the number of patients so classified.

Classification. All writers agree that premature separation of the placenta causing external hemorrhage alone and without complications is not often fatal to the mother although the fetal mortality may be considerable. On the other hand if the hemorrhage is mostly retained within the uterus and particularly if there is an accompanying toxemia not only is the infant death

Pathogenesis. The theories advanced during the last twelve years as possible causes of premature separation of the placenta may be grouped as those involving toxemia, maternal vascular disease, and the ductless glands.

According to Bartholomew, a toxin, apparently of specific nature, not only produces a destructive effect on the walls of the blood vessels, but also has a tendency to create shock. He identifies this as a poisonous split product of protein metabolism which results from the autolysis of acute infarcts on the maternal surface of the placenta. Balizfalvy thinks there is a special hemorrhagic poison arising from the placenta which also causes postpartum hemorrhage and intra-abdominal bleeding. Goethals, on the other hand, could find no evidence that the toxin, if present, differed in any way from that of preeclampsia, and Batusweiler holds the same view. Kellogg believes that the etiological factor in premature separation and in toxemia in some instances is the same.

Interesting experimental work on the production of premature separation of the placenta in animals has been done by Browne and by Hofbauer. Browne produced toxic nephritis in rabbits by the injection of sodium oxalate. In animals so prepared he caused premature separation of the placenta, red infarcts, and hemorrhage into the wall of the uterus by injections of uranium nitrate followed by injections of bacillus pyocyaneus. He believes that these results were due to an endothelial poison in the maternal blood which produced destruction of the syncytium and clotting in the maternal blood spaces. These clots in time caused obstruction to the maternal blood supply and thus death of the villi. Browne thinks that this same poison also produces bleeding in the uterine wall, in the broad ligaments, and elsewhere.

Hofbauer caused premature separation of the placenta, uterine spasm, edema of the uterine walls, hemorrhage into various organs, degenerative changes in the liver and kidneys, as well as marked shock, by the injection of histamine into guinea pigs. Histamine is derived from histidine, which is an intermediate metabolic product found in animals and may be formed in the intestinal tract by bacterial action.

Batusweiler believes that the kidney lesions in premature separation of the placenta are due to an infection arising in another portion of the body, such as the tonsils. He notes that there is little damage to the glomeruli, but he is of the opinion that the swelling which accompanies interstitial inflammation leads to suppression of the urine.

In Stroink's opinion, there is an essential change in the maternal blood vessels which weakens them and facilitates hemorrhage when the blood pressure rises. The hemorrhages in the wall of the uterus, he thinks, are due to sudden distention which leads to rupture of the blood vessels. Clauberg holds a somewhat similar view, and although he doubts the existence of any blood disease in the mother, he postulates a tendency to bleed. He, likewise, believes that the subserous hemorrhages and cracks are due to distention.

De Snoo thinks the kidney changes are secondary to uterine hemorrhage and distention which act in a reflex manner. Beker holds a somewhat similar view, believing that the diminished renal blood supply causes albuminuria.

The chief advocates of the endocrine theory are Heim and Shute. Heim found an amount of prolactin in the urine which was greater than that in any complication of pregnancy except hydatidiform mole. He noted 1 case with hemorrhages in the ovaries similar to a prolactin effect, and 3 cases with persistently enlarged corpora lutea. Shute maintains that there are two types of toxemia in pregnancy: one which leads to eclampsia and is characterized by high prolactin, high thyroid hormone and very low blood cholin, and the other, which is the forerunner of premature separation of the placenta and is marked by high estrin, low thyroid hormone, and high blood cholin.

While the past twelve years have been fertile enough in speculation, the pathogenesis of this condition is not yet upon a firm foundation. No two writers appear to agree exactly. Moreover, the materialistic reader feels that on occasions he has been led across that faintly marked frontier which separates fact from fantasy.

Signs and Symptoms. The classical signs of premature separation of the placenta, such as bleeding, either external, internal, or both, usually associated with pain, the tender uterus of varied degrees of hardness which accompanies the retention of blood within its cavity, the frequent presence of albuminuria and hypertension, and, in marked cases, the existence of shock out of proportion to the blood lost, are mentioned by practically all authors. The sudden onset of the condition, often before the onset of labor, is stressed by Balizfalvy. Davis found the hemorrhage entirely concealed in 18 per cent of his cases, Goethals in 7.2 per cent, and Irving in 2.5 per cent. Vogt and Balizfalvy state that the blood lost is not bright red as in placenta previa, and FitzGibbon describes it as dark and not coagulating and believes it to be the hemorrhagic serum expressed from clots remaining in the uterus.

involving the decidua septa impede the outflow of blood so that the sinuses burst and produce retroplacental hemorrhages

In about one third of the cesarean sections reported by Goethals ecchymotic areas were apparent on the surface of the uterus. This condition, accompanied by hemorrhage and edema in the underlying muscularis is indicative of the uteroplacental apoplexy of Couvelaire. In 2 of Goethals' 12 cases showing this picture however, there was neither toxemia nor eclampsia. In 15 per cent Balizfalvy found hemorrhages also in the broad ligaments and Piazza noted a pre-dilection for the region of the ovaries. Free blood in the peritoneal cavity was reported in 43 per cent of Balizfalvy's cases. He believes that this usually arises from fissures in the peritoneal coat of the uterus or adnexa, but that it might also result from reflux through the tubes.

Material derived from the decidua, the fetal portion of the placenta, the uterine wall, the kidneys, the liver, and other organs has been studied microscopically. Kaufmann found necrosis with hemorrhage and thrombosis in the decidua and leucocytic infiltration of the submucous layer. Hertig observed a similar picture and in addition degeneration of the "moth eaten" type, as well as focal hyaline areas. In the spongy decidua he found multiple thrombi in all stages of organization, and degeneration of blood vessel walls resulting in the presence of numerous foamy, fat laden macrophages. Balizfalvy and Hertig call attention to the frequent production of hemorrhages into the fetal portion of the placenta.

Considerable speculation has arisen regarding the production of hemorrhages and edema in the superficial muscular layers of the myometrium. Naujoks believes that since these changes occur in the peripheral portion of the uterine wall, they are due directly to distension of the uterus. Clauberg also considers distension to be the important factor, since the hemorrhages are mostly subserous and are occasionally accompanied by cracks in the peritoneal coat. Balizfalvy disputes this and states in rebuttal that the uterine wall in some instances is normal beneath the placental site, in other cases the retroplacental hemorrhage is small and the uteroplacental apoplexy extensive, moreover, it may be more marked in remote regions of the uterus. Acute hydramnios produces no such effect nor is it seen in the walls of other organs when they become distended. Kaufmann found hemorrhages in the wall of the cervix, which is not subject to the initial distension produced by the retention of blood within the uterus. Balizfalvy further affirms that the blood vessel

walls in the myometrium are intact and that there is a deposition of iron pigment in the region of the hemorrhages, which suggests a leakage of blood by diapedesis rather than by actual rupture. Portes found uteroplacental apoplexy in cases in which there was little blood in the uterine cavity, which led him to believe that distension is not a factor. Moreover, he calls attention to the similarity of the hemorrhages to those found in the liver in eclampsia and believes that there is no proof that they result from lesions in the vessel walls. Piazza holds that increased intra uterine pressure added to the special hemorrhagic tendency which so often prevails in toxemia provides an adequate background for the production of the hemorrhages. Davis observed vacuoles in the cytoplasm of the muscle cells and in the walls of the small blood vessels, which he attributes to a lytic agent acting on both. He also noted an increase in the endothelial cells. Mestre found edema of the muscle bundles and proliferation of the connective tissue. Balizfalvy reports vacuolar degeneration of the muscle fibers with some swelling. He found thin walled blood vessels separated from the surrounding connective tissue and packed with blood corpuscles and also swelling of the endothelium of the capillaries.

Batzweiler has paid particular attention to the kidneys in premature separation. He noted swelling with an increase in their weight. The glomeruli were mostly normal in size and ischemic. Leucocytic infiltration was found in the interstitial tissues as well as in the walls of the glomeruli and there was swelling of the tubules. He characterizes the condition as inflammatory edema. Goethals reports a case with acute diffuse nephritis. Zalka reports 39 cases of cortical necrosis of the kidneys and calls attention to the fact that 31 of them were associated with pregnancy. Three of the 31 were associated with premature separation of the placenta. To these Manley and Kihman add another. It is interesting that the kidneys of Batzweiler's case present in an incipient form some of the features of cortical necrosis such as focal areas of inflammation and an increase in weight.

In Batzweiler's case the liver was negative, although in one case of Goethals there was the typical picture of eclampsia and in another an acute necrotizing hepatitis.

Balizfalvy describes a hemorrhage under the peritoneal lining of the pelvis which extended beyond the sigmoid and colon and upward as far as the left kidney. Piazza speaks of bleeding in the diaphragm, pericardium, meninges, gastric mucosa, and adrenals.

cent Batisweiler reports 9 cases from the literature with 8 deaths. In 3 of these decapsulation of the kidneys was done without success. He also reports 2 cases of his own with one decapsulation. Both terminated fatally. Batisweiler also used the x-rays to stimulate the kidney without success. Both he and Kellogg advocate the use of large amounts of parenteral fluid, up to 5 or 6 liters a day, with hypertonic glucose.

Coventry reports a case in which following a cesarean section the uterus sloughed and was discharged through the abdominal wall, leaving only the cervix. Harvey a death from circulatory collapse due to pericardial effusion, and Burczak a case of prolapse of the placenta. Of the 46 such cases that Burczak found in the literature, 35 resulted from a mechanical cause. Thirty-two mothers died, 10 lived, and the outcome could not be ascertained in 4.

Prognosis In Balizfalvy's opinion the prognosis depends upon the extent of the hemorrhage, the amount of bloody infiltration of the uterine wall and pelvic connective tissue, and the severity of the toxemia which accompanies the condition in so many severe cases. Many patients die of shock during or immediately following operation, and a certain number of those who survive the immediate crisis succumb to uremia.

Many writers in reporting results fail to state how many of their cases were in the comparatively mild group in which the hemorrhage was entirely external. Brodhead reports a maternal death rate of 26.4 per cent, Nicholls 15.4, Siegel 9.6, Balizfalvy from 8 to 10, Goethals 8.6, Gordon 7.7, Kraul 7.4, Davis 7.3, Robinson 6.5, Stroink 5, and Greenhill 3.6. Probably a fair average for all cases, including both the severe and mild, lies between 5 and 10 per cent.

Mahon reported a mortality of 41.6 per cent in 12 cases with true uteroplacental apoplexy. Troupin divided his cases into partial separation with a mortality of 2 per cent and complete separation with 18.4 per cent. Williams states that in Philadelphia from 1931 to 1934, inclusive, one of every 4 women who died of puerperal hemorrhage succumbed to this cause. Of 19 such patients, he pointedly adds, only 3 received transfusions.

The future of women recovering from premature separation of the placenta has engaged the attention of a number of authors. Stroink, in a follow up of from two to twenty years, found that 51 per cent had traces of arteriosclerosis, nephritis, or apoplexy. Smith and Gordon each report a woman who had attacks in 2 successive pregnancies, and Siirala, a patient with the same con-

dition in 3 successive pregnancies. De Snoo found that 61 per cent of 85 women studied from two to twenty years later had elevated blood pressure. He believes the eventual prognosis to be worse than in eclampsia. Portes followed up 22 women who later had 60 pregnancies but only 15 living infants.

The fetal mortality is extremely high and depends largely upon the degree of placental separation and upon the intra-uterine age of the fetus. Nicholls reports 100 per cent, O'Connor 94.6, Brodhead 85.3, Robinson 65, Goethals 61.5, and Davis 60. Balizfalvy's statement that it falls between 60 and 90 per cent is probably correct.

Treatment While practically all writers are agreed that expectancy, or rupture of the membranes with or without the administration of pituitary extract is all that is needed to insure the safety of patients with external bleeding only, there is considerable difference of opinion regarding the proper treatment of the severe cases with internal hemorrhage. The radical group believe that cesarean section offers these patients the best chance of recovery. Balizfalvy says even that cesarean section, preferably of the lower segment and under local anesthesia, is the only safe treatment. He advocates stimulation and transfusion, and amputation of the uterus if necessary, which procedure he admits was accompanied by a 25.6 per cent mortality in 82 cases. Whatever one may think of the advisability of cesarean section in these cases, one may well question the safety of hysterectomy, which according to this author had a death rate of 1 in 4. Brodhead favors cesarean section but not removal of the uterus unless it fails to contract. Falls is definitely opposed to conservatism. He advocates cesarean section in primiparae, especially if they are elderly, if the infant is viable or shows signs of distress, or if there is more hemorrhage than ordinary spotting. Such a policy would lead to major surgery in a number of cases of external bleeding which most obstetricians would treat by expectancy. Harris believes in cesarean section if the bleeding is of the concealed type, and in the removal of the uterus if it fails to contract. LeLorier, with great frankness, describes a woman upon whom he was about to perform cesarean section who practically precipitated the fetus. He was, however, able to apply forceps. Mahon reports 12 patients with uteroplacental apoplexy delivered by the abdominal route. There were 5 cesarean sections with 20 per cent mortality, 5 such operations followed by hysterectomy with 66 per cent mortality, and 2 amputations of the unopened uterus with 50 per cent mortality. Phaneuf and O'Con-

Dieckmann found the hemoglobin, hematocrit, and serum protein lowered in proportion to the hemorrhage. *Balitzsally* describes the pain in internal hemorrhage as intense with relatively free intervals. *Gordon* found pain present in 75.3 per cent of his cases. *Tiber* and *Turkel* report a case with sharp subscapular pain. *Bartholomew* found the uterus rigid in 62.2 per cent of his cases, *Goethals* in 48.2 per cent, and although *Gordon* does not believe rigidity absolutely necessary for a diagnosis, he found it in 43 per cent. In 14 cases in which he performed cesarean section *DeVormandie* found uterine rigidity absent only twice although in 6 instances there was no pain. A change in the size and form of the uterus is mentioned by *Balitzsally* and *O'Connor*, and *Beavers* states it may even be noted by the patient. *Balitzsally* suggests that tenderness in the lower quadrants may indicate hemorrhage into the broad ligaments. *Portes* states that the uterine rigidity may extend to the lower segment. Changes in the contractility of the uterus were commented upon by *Balitzsally*, either the uterus empties itself rapidly or it enters a state of immobility. *Beavers* also notes that the strength of the uterine contractions may be increased by separation of the placenta. He and *Nicholls* both speak of the hyperactivity of fetal movements preceding their cessation when the fetus dies. The element of shock is dwelt upon by *Balitzsally*, *Beavers*, *Portes*, and *Bartholomew* who noted it in 38 per cent of his patients. *Verdeuil* believes that the amount of blood lost does not determine the degree of shock, since he found shock present in one case in which the uterus contained only 100 c cm of blood. *Portes* says that the presence of a normal pulse does not rule out the diagnosis of premature separation of the placenta.

Albuminuria was noted in more than half the cases by *Balitzsally*, who states that it often does not appear until after separation has taken place. *De Snoo* noted it in 63 per cent of his cases while *Vogt* noted albuminuria or hypertension in 90 per cent. *De Snoo* says that because of the hemorrhage the blood pressure is not elevated and *Balitzsally* speaks of the rapid fall in arterial tension that accompanies shock. *Battisweiler* found an elevated non-protein nitrogen and normal blood chlorides which he interpreted as indicating an inflammatory condition of the kidneys. On the other hand he believes that a high non-protein nitrogen and high blood chlorides are indicative of nephritis. *Kellogg* also noted a similar condition and believes that when recovery takes place the kidney must begin to secrete non-nitrogenous products before it secretes nitrogenous products.

He considers high blood pressure as a protective mechanism.

O'Connor notes the ineffectual desire to urinate or defecate which is found in some patients, as well as thirst, precordial pain, fear, and subicteric cyanosis. *De Snoo* mentions the occasional presence of jaundice. *Portes* calls attention to toxic dyspnea, epigastric pain, visual disturbances, ringing in the ears and syncope. *Randall* observes spasm of the retinal vessels in the ocular fundi. *Richardson* believes that placental separation may disturb the oxygen-carbon-dioxide balance in the fetal circulation and thus alter the heart rate. *Shute* bases his diagnosis of mild degrees of placental separation in pregnancy largely on recurrent local uterine tenderness over the placental site and an excess of strain in the blood. He advocates the use of Vitamin E in the form of wheat germ oil.

Differential Diagnosis. The most practical and therefore the most intelligent statement regarding the differential diagnosis is made by *Harris*, who says that under no circumstances should a vaginal examination be made unless all preparations have been completed to control hemorrhage, induce labor or empty the uterus. This means that the patient should be examined in an operating room under anesthesia, with assistants and instruments ready for the insertion of a Voorhees bag or the performance of the Braxton-Hicks version or cesarean section should there be a mistake in the tentative diagnosis and placenta previa be found. Many patients have bled to death from the hemorrhage caused by this manipulation before means could be employed to check it, and many will continue to do so until such precautions are made routine in every well regulated clinic.

Aside from placenta previa, *Balitzsally* lists as conditions with which premature separation of the placenta is confused: rupture of the uterus, advanced ectopic pregnancy, pelvic tumor with torsion of the pedicle, bleeding from a ruptured uterine or broad ligament varix and acute appendicitis. *O'Connor* adds any acute abdominal emergency and *Vogt* the rupture of any abdominal viscus. *Quarantotto* reports a case which was mistaken for premature separation of the placenta although the bleeding actually arose from the rupture of an umbilical vessel in the placenta. *Pudolph* reports a case with both premature separation and marginal placenta previa.

Complications. Aside from shock and hemorrhage the most important and dangerous complication of premature separation of the placenta is partial or complete anuria. *Balitzsally* found it in 2.8 per cent of his cases and *Goethals* in 4 per

the whole course of treatment Irving found a reduction in the need for transfusion of from 27.5 to 11.7 per cent after the substitution of conservative measures for cesarean section. Ginglinger advocates the use of pituitary extract intravenously, and Harris, Schneiders, and Shute call attention to the efficacy of the new preparations of ergot.

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nor both advise hysterectomy and Sigel reports a mortality in cesarean section of 18 per cent.

Other writers occupy a middle ground. Davis advocates rupture of the membranes and the use of a primary extract in the patient is in labor otherwise cesarean section under local anesthesia with hysterectomy is necessary. He and McGee report a mortality in cesarean section of 11.4 per cent. Greenhill approves of the same treatment in similar cases. Paves says that such a rupture of the membranes is enough in two-thirds of the cases. If contractions ensue it is an indication of true cervical dilatation. If contractions do not supervene he advises cesarean section followed by hysterectomy if the subsequent minor hemorrhages are too extensive. Robinson advises cesarean section under local or spinal anesthesia if the cervix is dilated. The use of spinal anesthesia which may cause a fall in the blood pressure in patients already in shock may have to be questioned.

The conservatives do not believe in cesarean section in severe toxemia, hemorrhage, whether the patient be in labor or not, or the cervix open or closed. The only emergency they make is when the placenta is alive well vital, and the patient is in great distress. Barry never does not consider these patients good cases for cesarean section and hysterectomy. He advocates rupture of the membranes a high abdominal incision, primary extract, and transfusion be delivered 52 patients with a mortality of 19 per cent. Briggs believes that each patient weakened by loss of blood in shock and often suffering from toxemia, are extremely poor risks for major surgery. He reports 49 patients treated by rupture of the membranes, vaginal pack, and binder with a 4 per cent mortality. Gordon thinks the few patients need cesarean section and hysterectomy, those in shock. In most cases he employs the Beck binder with small amounts of potassium permanganate. He reports 9 cases with only 1 cesarean section and no deaths. In his opinion conservative methods give far better results than the radical measures that are still advocated today. Polak advocated morphine rupture of the membranes, the high abdominal binder and repeated small doses of a primary extract. His mortality was 6.2 per cent. FitzGibbon states that the uterus contracts well even when the hemorrhage is continued, an opinion which is shared by Hirschman. FitzGibbon had a mortality of 4.6 per cent with expectant treatment, or rupture of the membranes alone accompanied by transfusion if the patient was in collapse. Heffernan delivered 4 patients by rupture of the membranes

vaginal tamponade and the Spanish writers binder with no deaths. Even the same method Irving reports a mortality of 20 per cent in patients true at the same way, whereas the mortality in his clinic by cesarean section hysterectomy had been 14.2 per cent. He states that only 1 patient has died from this condition since 1910. When more than one-half of the placenta was retained, Dr. Sacco had a death rate of 1 per cent when his patients were conservative binder and 22 per cent under radical measures.

From a study of the literature there can be little doubt that conservative measures are accompanied by a considerably lower mortality than a cesarean section. A number of abdominal deliveries were effected because the cervix dilated, the bleeding could not be controlled otherwise, or that severe contractions would not relax and even the most extreme of the protracted breech would supervene and therefore for several abdominal operations would afford the opportunity for a hysterectomy. On the other hand, there was a fear the conservative action here from the application of a high vaginal pack secured to a pressure binder by a pessary band would cause the breech to rise into the uterus and the membranes were ruptured and small doses of potassium permanganate were administered and the post-cesarean hemorrhage was treated as normal. But even a more exact study was necessary required. FitzGibbon states that he has never seen post-partum hemorrhage even in the severe cases. Moreover he has found that the partial or complete rupture from which so many of these patients suffered on admission to the hospital has disappeared at or before delivery.

A few writers have advocated manual dilation of the cervix in cases in which it could be "easily accomplished." Since this operation even in a normal woman is always a very primitive of laceration and laceration of blood, this method is apt to be the reason to be not common. The deaths due to a primary separation were those when a normal cervix was routine treatment. Three text books, either new or new editions of standard works, and published within the last few years make no such unreserved recommendation. Mention of vaginal cesarean section in the most extensive gynecological and obstetrical.

Transfusion is recommended by numerous authors among others by Blandy, Blandy, now Blandy, Davis, Dickinson, Gertman, Gordon, Irvine, Keating, Nichols, O'Connor, Planché, and Polak. It is advisable always to have on hand one or more saline dextrose during

the whole course of treatment Irving found a reduction in the need for transfusion of from 27 5 to 11 7 per cent after the substitution of conservative measures for cesarean section Gingleger advocates the use of pituitary extract intravenously, and Harris, Schneiders, and Shute call attention to the efficacy of the new preparations of ergot

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nor both advise hysterotomy and Siegel reports a mortality in cesarean section of 18.1 per cent.

Other writers occupy a middle ground. Davis advocates rupture of the membranes and the use of pituitary extract if the patient is in labor, otherwise cesarean section under local anesthesia with hysterectomy if necessary. He and McGee report a mortality in cesarean section of 11.4 per cent. Greenhill approves of the same treatment for similar cases. Portes says that simple rupture of the membranes is enough in two thirds of the cases. If contractions ensue, it is not a case of true uteroplacental apoplexy. If contractions do not supervene he advises cesarean section, followed by hysterectomy if the subserous uterine hemorrhages are too extensive. Robinson advises cesarean section under local or spinal anesthesia if the cervix is closed. The use of spinal anesthesia, which may cause a fall in the blood pressure in patients already in shock, may fairly be questioned.

The conservatives do not believe in cesarean section in severe internal hemorrhage, whether the patient be in labor or not, or the cervix open or closed. The only exception they make is when the infant is alive, well, viable, and the patient in good condition. Bartholomew does not consider these patients good risks for cesarean section and certainly not for hysterectomy. Employing rupture of the membranes, a tight abdominal binder, pituitary extract, and transfusion he delivered 52 patients with a mortality of 1.9 per cent. Burgess believes that such patients, weakened by loss of blood in shock and often suffering from toxemia, are extremely poor risks for major surgery. He reports 76 patients treated by rupture of the membranes, vaginal pack, and binder with a 4 per cent mortality. Gordon thinks that few patients need cesarean section and certainly not those in shock. In most cases he employs the Beck binder with small amounts of pituitrin. Kornfeld reports 38 cases with only 1 cesarean section and no deaths. In his opinion conservative methods give far better results than the radical measures that are still advocated today. Polak advocated morphine, rupture of the membranes, the tight abdominal binder, and repeated small doses of pituitary extract. His mortality was 6.2 per cent. FitzGibbon states that the uterus contracts well even when the hemorrhage is concealed, an opinion which is shared by Hamerschlag. FitzGibbon had a mortality of 4.6 per cent with expectant treatment or rupture of the membranes alone accompanied by stimulation if the patient was in collapse. Heffernan delivered 7 patients by rupture of the membranes,

vaginal tamponade, and the Spanish windlass binder with no deaths. Using the same method Irving reports a mortality of 2.9 per cent in 38 patients treated the same way, whereas the mortality in his clinic by cesarean section previously had been 14.5 per cent. He states that only 1 patient has died from this condition since 1931. When more than one-half of the placenta was separated, De Snoo had a death rate of 6 per cent when his patients were conservatively treated and 33 per cent under radical measures.

From a study of the literature there can be little doubt that conservative measures are accompanied by a considerably lower mortality than is cesarean section. A number of abdominal deliveries were effected because it was feared that the bleeding could not be controlled otherwise or that uterine contractions would not set in and expel the uterine contents, or that post partum hemorrhage would supervene and therefore the opened abdomen would afford the opportunity for a hysterectomy. On the other hand, those who follow the conservative school have found that the application of a tight vaginal pack secured to a pressure binder by a perineal band would check the hemorrhage that labor would supervene if the membranes were ruptured and small doses of pituitary extract repeatedly given, and that post partum hemorrhage so seldom occurred that even uterine tamponade was infrequently required. FitzGibbon states that he has never seen post partum hemorrhage even in the severe cases. Moreover, he has found that partial or complete anuria, from which so many of these patients suffered on admission to the hospital, has disappeared after delivery.

A few writers have advocated manual dilatation of the cervix in cases in which it could be safely accomplished. Since this operation, even in normal women is almost always productive of laceration and frequently of shock, this suggestion appears to the reviewer to be most unfortunate. The darkest days of premature separation were those when *accouchement forcé* was routine treatment. Three text books, either new, or new editions of standard works and published within the last few years make the same ill advised recommendation. Mention of vaginal cesarean section in the recent literature is infrequent and not significant.

Transfusion is recommended by numerous authors among others by Balczalvy, Bartholomew, Batsweiler, Davis, Dieckmann, Goethals, Gordon, Irving, Kellogg, Nicholls, O'Connor, Phaneuf, and Polak. It is advisable always to have on hand one or more suitable donors during

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Valle, G.: Modern Concepts of Acid-Base Equilibrium in Pregnancy and Their Relation to Various Diets (Moderni concetti sullo squilibrio acido-basi in gravidanza e suoi rapporti con razioni alimentari diverse) *Ginecologia*, Torino, 1937, 3 923

This is a highly technical detailed report on acid-base equilibrium in pregnancy, particularly in relation to diet. There is a detailed description of the complex bibliography in this field and a critical evaluation of the various technicalities, the colorimeter, electrometer, potentiometer, and determination of carbon dioxide tension and urinary acidity. The author stresses the great variation in the results of numerous investigators due to the comparative unreliability of some of the procedures. However, some facts have been established. There is a definite hyperproduction of ketone bodies in the blood during pregnancy. Another cause of the relative acidosis in pregnancy is the increase in circulatory lactic acid. The uric acid of the blood is within normal limits and has no relation to acidosis of pregnancy. Whether circulating amino-acids have any relation to the acidosis of pregnancy is still undetermined. However, the fatty acids in the circulating blood are increased as are all the lipid fractions. There is likewise a considerable amount of circulating inorganic acid in pregnancy which lowers the alkaline reserve. Hyperventilation in pregnancy is also a factor which has a tendency to lower the alkaline reserve.

The author carried out his studies on 10 non-pregnant women, 15 women in the ninth month of pregnancy, and 4 women who were under observation throughout the entire course of their pregnancy. On the basis of these studies he concludes that the alkaline reserve is diminished during pregnancy. However, the pH of the blood did not undergo any fluctuations in relation to an acid or alkaline, ketogenic or anti-ketogenic diet. In short, he decided that the variations in the alkaline reserve are practically independent of acid or alkaline diets. The urinary reactions fluctuated with the acid and base intake of the diet. From a practical standpoint with regard to the diet in normal pregnancy, it is important that the author was unable to affect the alkaline reserve, whether by hyperlipoid, hyperprotein, or acid-forming diets. This allows for a considerable range of diet in normal pregnancy. Of course, it does not hold for an abnormal or pathological state.

JACOB E. KLEIN, M.D.

Needles, W., and Davison, C.: Disease of the Spinal Cord in Pregnancy. *Am J Obst & Gynec*, 1938, 35 52

One case of myelopathy of pregnancy which was studied clinicopathologically, and another observed clinically are reported.

In a survey of previous histological reports the author shows that the underlying pathological process is degenerative or hemorrhagic in character.

Reasons for believing that myelopathy of pregnancy may be due to some toxic factor, the exact nature of which remains as yet undetermined, and that vitamin deficiency may play a contributory rôle in the production of the disease have been presented.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Doederlein, A.: Reforms in Operative Obstetrics (Reformen in der operativen Geburtshilfe) *München med Wchenschr*, 1937, 1 601

The old masters of gynecology protest against stretching the indications for cesarean section. Apart from the well recognized dangers of cesarean section these indications limit the activity of the general practitioner who performs deliveries in the home.

The practitioner should be trained in all of the diagnostic methods and be able to carry out any of the vaginal maneuvers. In the version of the transverse presentation, the practitioner should not wait for complete dilatation of the cervix as the expectation of the impacted shoulder entails too much danger. When transportation to the clinic is difficult it is the lesser evil to perform the version in the home, in spite of the poor prognosis for the child.

The practitioner should limit his use of the forceps to the low variety. The high-forceps delivery in the home is, unfortunately, merely a last resort and usually must be followed by cranioclasia. In breech delivery, the use of the forceps on the aftercoming head should have more widespread acceptance. The instrument is less damaging than any of the recommended manual methods of extraction or expression. If the size of the aftercoming head must be reduced it should be done from the cervical region and then the craniotripter employed. For the morcellation of the head in head delivery, the three-bladed instrument of Auvard-Zweifel is the most advantageous. If the shoulders do not follow the birth of the head, the head is cut off, both arms are brought down and the trunk is brought down in like manner. This procedure is superior to cleidotomy. In unreduced transverse presentation the chain saw is preferable.

(H. FUCHS) WILLIAM C. BECK, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Krels, J.: The Surgical Treatment of Suppurative Puerperal Mastitis (Traitement chirurgical de la mastite puerpérale suppurée) *Gynec et obst*, 1937, 36 499

The author describes his surgical treatment of puerperal abscess of the breast. Instead of the usual radial incision, he advocates the periareolar ap-

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OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Valle, G.: Modern Concepts of Acid-Base Equilibrium in Pregnancy and Their Relation to Various Diets (Moderni concetti sullo squilibrio acido-basi in gravidanza e suoi rapporti con ragioni alimentari diverse) *Gynecologia*, Torino, 1937, 3 923

This is a highly technical detailed report on acid-base equilibrium in pregnancy, particularly in relation to diet. There is a detailed description of the complex bibliography in this field and a critical evaluation of the various technicalities, the colorimeter, electrometer, potentiometer, and determination of carbon dioxide tension and urinary acidity. The author stresses the great variation in the results of numerous investigators due to the comparative unreliability of some of the procedures. However, some facts have been established. There is a definite hyperproduction of ketone bodies in the blood during pregnancy. Another cause of the relative acidosis in pregnancy is the increase in circulatory lactic acid. The uric acid of the blood is within normal limits and has no relation to acidosis of pregnancy. Whether circulating amino-acids have any relation to the acidosis of pregnancy is still undetermined. However, the fatty acids in the circulating blood are increased as are all the lipid fractions. There is likewise a considerable amount of circulating inorganic acid in pregnancy which lowers the alkaline reserve. Hyperventilation in pregnancy is also a factor which has a tendency to lower the alkaline reserve.

The author carried out his studies on 10 non-pregnant women, 15 women in the ninth month of pregnancy, and 4 women who were under observation throughout the entire course of their pregnancy. On the basis of these studies he concludes that the alkaline reserve is diminished during pregnancy. However, the pH of the blood did not undergo any fluctuations in relation to an acid or alkaline, ketogenic or anti-ketogenic diet. In short, he decided that the variations in the alkaline reserve are practically independent of acid or alkaline diets. The urinary reactions fluctuated with the acid and base intake of the diet. From a practical standpoint with regard to the diet in normal pregnancy, it is important that the author was unable to affect the alkaline reserve, whether by hyperlipoid, hyperprotein, or acid-forming diets. This allows for a considerable range of diet in normal pregnancy. Of course, it does not hold for an abnormal or pathological state.

JACOB E. KLEIN, M.D.

Needles, W., and Davison, C.: Disease of the Spinal Cord in Pregnancy. *Am J Obst & Gynec*, 1938, 35 52

One case of myelopathy of pregnancy which was studied clinicopathologically, and another observed clinically are reported.

In a survey of previous histological reports the author shows that the underlying pathological process is degenerative or hemorrhagic in character.

Reasons for believing that myelopathy of pregnancy may be due to some toxic factor, the exact nature of which remains as yet undetermined, and that vitamin deficiency may play a contributory rôle in the production of the disease have been presented.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Doederlein, A.: Reforms in Operative Obstetrics (Reformen in der operativen Geburtshilfe) *Munchen med Wchnschr*, 1937, 1 601

The old masters of gynecology protest against stretching the indications for cesarean section. Apart from the well recognized dangers of cesarean section these indications limit the activity of the general practitioner who performs deliveries in the home.

The practitioner should be trained in all of the diagnostic methods and be able to carry out any of the vaginal maneuvers. In the version of the transverse presentation, the practitioner should not wait for complete dilatation of the cervix as the expectation of the impacted shoulder entails too much danger. When transportation to the clinic is difficult it is the lesser evil to perform the version in the home, in spite of the poor prognosis for the child.

The practitioner should limit his use of the forceps to the low variety. The high-forceps delivery in the home is, unfortunately, merely a last resort and usually must be followed by cranioclasia. In breech delivery, the use of the forceps on the aftercoming head should have more widespread acceptance. The instrument is less damaging than any of the recommended manual methods of extraction or expression. If the size of the aftercoming head must be reduced it should be done from the cervical region and then the craniotripter employed. For the morcellation of the head in head delivery, the three-bladed instrument of Auvard-Zweifel is the most advantageous. If the shoulders do not follow the birth of the head, the head is cut off, both arms are brought down and the trunk is brought down in like manner. This procedure is superior to cleidotomy. In unreduced transverse presentation the chain saw is preferable.

(H. FUCHS) WILLIAM C. BECK, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Kreis, J.: The Surgical Treatment of Suppurative Puerperal Mastitis (Traitement chirurgical de la mastite puerpérale suppurée) *Gynec et obst*, 1937, 36 499

The author describes his surgical treatment of puerperal abscess of the breast. Instead of the usual radial incision, he advocates the periareolar ap-

proach because, as demonstrated by his experience in 43 cases, the cosmetic results are superior to those obtainable by other methods.

A semi circular incision is made at the border of the areola closest to the abscess. The skin incision is made carefully to permit proper healing. After penetration of the skin the incision is extended obliquely toward the abscess until pus appears. A closed forceps is then introduced and opened to enlarge the opening. A perforated rubber drain is then inserted.

When the abscess occupies the lower mammary quadrant a counter incision, at a dependent portion is made in the breast tissue itself not below or behind the breast to permit more adequate drainage. This is necessary whenever the breast is large and pendulous. The counter incision is also semi-circular and parallels the base of the breast.

Proper care depends upon careful attention to details particularly upon the time chosen for surgical intervention. Undue delay after localization when necrosis jeopardizes the overlying skin precludes healing by primary intention. Too early incision before localization, is equally bad. If it is impossible to tell by palpation whether pus has formed its formation can be surmised by the fall in temperature or its return to normal after a febrile period.

Only rubber drainage tubes are used; gauze impedes drainage. If drainage continues for more than three days the drain should be shortened or replaced by one of smaller caliber. In general drainage rarely persists for more than one week, usually only for three days. Approximation of the wound edges by adhesive straps is carried out after the discharge stops. If additional abscesses form, they may be opened through the original areolar incision.

The author believes that the old argument in favor of the radial incision, namely that it parallels rather than cuts across the blood vessels and lacteal ducts does not hold. In his opinion the radial course of these structures holds only in the case of the small rounded breast not for the majority which are large heavy and pendulous. Since the blood supply of the areola is capillary bleeding from the periareolar incision is minimal. The objections to the periareolar incision are therefore only theoretical. The practical results in the author's experience are excellent as regards both functional and cosmetic results.

HAROLD C. MACK, M.D.

NEWBORN

Setdentopf H. The Prognosis of Growth and Mortality of Children Born Prematurely (Aufzuchtswert und Mortalität der Frühgeburten). *München med. Wchnsch.* 1937 1: 884.

Of 1,032 children born prematurely at the gynecological clinic in Leipzig during the period from 1920 to 1923, 1938 now between the ages of twelve and fourteen years could be reported as living in 1934 and 1935. In these the physical development as well as the mental reactions were observed and estimated.

Physical development was classed as good in 76, fair in 77, and poor in 35. Of the 7 children with the poorest physical development, 4 showed conditions that could not be attributed to other causes than their premature delivery. In all of the physically underdeveloped children, the mental status was normal, and therefore they would not become a burden on the community. The mental development was estimated by forming a general impression and comparing it with the scholastic attainments. The intelligence was well developed in 95, fair in 87, and poor in 36. Of the latter group, 7 had such poor development that they will unquestionably become a burden to the community, yet in only 3 of the 7 could the premature delivery be held directly responsible for the condition. There was a striking difference in the mental development of the children delivered of married mothers from that of those delivered of unmarried mothers. In 88 deliveries of unmarried mothers 21 children were definitely poorly developed mentally, while of 100 deliveries of married mothers only 25 children showed poor mental development. Therefore there were 185 useful individuals and only 3 inferior individuals in this series of children born prematurely.

The mortality in the clinic and at various time intervals after discharge is reported in the original article. Also the mortality in the different weight groups is given. There is a high mortality in the children who have been discharged from the clinic even among those who are approaching or have reached their normal weight. This is attributed to the poor after care which is carried out in the home. The author therefore emphasizes the importance of retaining the premature infant in the institution for a long time in the interest of the general community. (E. K. KOTY) WILLIAM C. BECK

MISCELLANEOUS

Phaneuf L. E. Hydatidiform Mole and Chorion Epithelioma. *New England J. M.* 1938 217: 770.

Hydatidiform mole, also known as myxoma chorion vesicular mole, molar pregnancy, uterine hydatid, hydatid mole, dropsy of the villi and blasenmole is a cystic degeneration of the chorionic villi.

The cause of hydatidiform mole is unknown but seems to be in some specific fault in the development of the chorionic villi. All moles must be regarded as rapidly growing tumors of embryonic origin and of potential malignancy. There is no cellular arrangement which might give information as to their probable benign or malignant nature and Hirschmann states definitely that there are no morphological criteria of value in establishing a prognosis.

Lutein cysts of the ovary frequently accompany vesicular mole. They are usually bilateral, and are known to regress in a number of instances following the expulsion of the pathological placenta. They may persist, however, and frequently do so when chorionepithelioma develops. Recently the origin of these cysts has been attributed to the presence of

excessive amounts of hormones similar to those of the pituitary gland in patients with hydatidiform mole

The management of vesicular mole has been the subject of considerable discussion in the literature and has varied from ultraconservatism to radicalism. The possibility of the development of chorionepithelioma following the expulsion of this tumor has influenced each operator in making up his mind on one or the other form of treatment. Since no individual has seen a large number of these pathological placentas, the operator has been actuated to his treatment by the number of cases of malignant degeneration which developed in his own series. In young women, evacuation of the mole by digital or instrumental curettage is the accepted procedure. One must bear in mind the dangers attendant on such a procedure, since curettage of a large cavity frequently results in perforation of the uterus, followed in many instances by infection and peritonitis. All authors emphasize the dangers of this method. A curettage under these conditions is a blind procedure which does not allow the discovery of invasive areas in the uterine musculature.

In older women nearing the menopause, most authors are of the opinion that hysterectomy should be employed in many cases. In any event, the patient should be observed for a period of two years, and the Aschheim-Zondek or the Friedman test should be given monthly for the first year.

In the last twenty-three years Phaneuf has seen 9 cases of hydatidiform mole. Four of the women developed chorionepithelioma. All the patients with mole and chorionepithelioma were saved. In his case of chorionepithelioma in 1933 Phaneuf made use of the Aschheim-Zondek test, and in his case of chorionepithelioma in 1936 he made quantitative estimations of the urine for gonadotropic hormone. His conclusions are as follows:

1 Hydatidiform mole, or pathological placenta, is a cystic degeneration of the chorionic villi

2 Lutein cysts of the ovaries, which are usually bilateral, frequently accompany the condition and may regress after the expulsion of the mole. They may persist when chorionepithelioma develops

3 The biological test of pregnancy is strongly positive

4 Treatment consists of evacuating the uterine cavity by digital or instrumental curettage, or under direct vision by an abdominal hysterotomy

5 Monthly pregnancy tests should be performed for one year. A positive reaction longer than six weeks after the evacuation of a mole denotes the persistence of chorionic epithelium

6 Chorionepithelioma is a highly malignant tumor developing after the formation of fetal cells. It may follow labor, abortion, extra-uterine pregnancy, or hydatid mole

7 The diagnosis has been simplified with the advent of the biological test

8 A positive pregnancy reaction and a progressive increase of gonadotropic substance six weeks after expulsion of a mole suggest chorionepithelioma

9 Metastases, which are rapid and widespread, occur by the way of the blood stream, since the syncytium erodes and penetrates blood vessels

10 The treatment consists of a radical panhysterectomy with bilateral salpingo-oophorectomy. This may be preceded by an application of radium and followed by deep x-ray therapy

11 Nine cases of hydatidiform mole and 4 cases of chorionepithelioma are reported

Phaneuf has written a most interesting and comprehensive article on hydatidiform mole and chorionepithelioma

There were some very interesting discussions of this article, particularly that of Hertig of Boston. Hertig, through the cooperation of pathologists, obstetricians, and gynecologists in New England as well as other places throughout the country, has obtained the paraffin blocks and slides along with follow-up records of over 100 cases of hydatidiform mole. This in itself is a valuable amount of material. Hertig has studied these specimens with the idea of correlating a morphological picture in the original mole with the ultimate outcome, and he believes that he has accomplished something in this respect. He assumed that certain moles were benign because of the presence of the following general histological picture:

1 Normal chorionic epithelium

2 Slight, undoubted benign hyperplasia without mitoses or anaplasia

3 Moderate to marked benign hyperplasia with occasional anaplastic cells, that is, those of increased size with enlarged, irregular hyperchromatic and darkly staining nuclei

Hertig reports a preliminary study of 24 cases, 12 of which he originally classified as "benign," "probably benign," or "possibly benign," respectively. In one of the cases which he classified as being "possibly benign" (by which he broke his own rules) chorionepithelioma developed subsequently. He diagnosed 12 other cases as "potentially malignant," "probably malignant," or "malignant" on the basis of one or more of the following features:

1 Invasion of villous stroma by relatively undifferentiated chorionepithelial elements

2 Moderate to marked anaplasia of the epithelium, either with or without mitotic activity

3 Tissue-culture-like growth of detached chorionepithelial elements, usually in fairly large masses and growing upon the surface of a blood clot

Of 12 hydatidiform moles which he considered "potentially malignant," "probably malignant," or "malignant," 8 ultimately became malignant. From this study he concludes that Hirschmann's categorical statement that one cannot tell much about a mole by looking at it is not entirely warranted. He advises thorough study of many sections of mole and thorough study of the curettings obtained at the time of the removal of the original mole. He admits that 24 cases do not form a large enough series from which to draw conclusions, even though a given trend appears to be fairly definite, and is continuing

his work in the attempt to get a really significant series of hydatidiform moles to study carefully from a pathological standpoint. He invites obstetricians, gynecologists, and pathologists to cooperate with him by sending material with histories.

ALBERT MATTHEU M D

McClure, H J. Maternal Mortality in Hospital Practice. *J Obst & Gynaec Brit Emp*, 1937 44: 997

This paper is an analysis of 141 consecutive deaths in the Belfast Maternity Hospital and the Royal Maternity Hospital, Belfast in the period from 1927 to 1936.

Puerperal sepsis was responsible for the deaths of 33 patients, 23.4 per cent. An analysis of these shows normal delivery in 14, ante partum hemorrhage in 6, spontaneous delivery with post partum hemorrhage in 5, failure to deliver with the use of forceps in 2, craniotomy in 2, clean cesarean section in 2, pre eclamptic toxemia in 1, and undelivered intrapartum sepsis in 1. From this analysis two facts stand out as significant: puerperal sepsis followed normal delivery in 14 cases, and hemorrhage occurred in 11 cases.

Obstetrical shock and post partum hemorrhage accounted for the deaths of 23 patients, 16.3 per cent. In 3 phthisis undoubtedly was a factor contributing to the death of the patient. Delivery was spontaneous in 12 patients and instrumental, manipulative or operative in 11 patients. The predisposing and exciting factors in the production of shock are hemorrhage, fatigue, starvation, anesthesia, toxemia, trauma, exposure, and poor general condition from any cause. Post partum hemorrhage occurred in 19 of the 23 patients who died from obstetrical shock.

Eclampsia was responsible for the death of 15 patients, 10.7 per cent. Not one of the patients in this series had received adequate antenatal care, and 11 patients under thirty years of age succumbed from what should have been an entirely preventable condition. During the period which is reviewed 91 eclamptic patients were admitted to the hospital, with a death rate of 16.4 per cent.

Fifteen patients, 10.7 per cent, died from some form of heart disease. Of these 5 were primiparas, 3 were pregnant for the second time, 1 was pregnant for the third time, 2 were pregnant for the sixth time, and 1 each for the seventh, ninth, tenth, and twelfth times.

Since the year 1929, 110 patients with heart disease in pregnancy were admitted to these hospitals. The pregnancy was terminated in 17 patients, 7.8 per cent; cesarean section was performed in the case of 38 patients, 17.5 per cent. Thus in 55 or 25.3 per cent of the patients the cardiac condition was so grave that pregnancy and labor could not be permitted to continue their normal course. During the period under review, cesarean section was performed on 305 occasions and in the cases of 44 patients, 14.4 per cent, the indication for the opera-

tion was heart disease. Two requirements stand out above all others if the mortality from this complication is to be reduced: (1) the need for rest or antenatal care, and (2) the need for the adoption of contraceptive measures.

Acute yellow atrophy of the liver accounted for the death of 6 patients, 4.3 per cent. The records indicate that prolonged labor occurred in each case, the average time being eighty-two hours. Delivery in every case was instrumental or assisted. Chloroform was the anesthetic administered and in the cases of 2 patients it was given on two occasions. These 2 patients were admitted to the hospital after delivery with forceps failed. All 6 patients were pregnant for the first time and 2 were suffering from pre eclamptic toxemia. Death occurred within a relatively short time after delivery, the average period being eighty-two hours.

Five patients, 3.6 per cent, died from anemia of pregnancy. In all 5 cases the disease had reached an advanced stage before the patient was admitted to the hospital. Not one of these patients had had antenatal supervision. There is every reason to believe that anemia of pregnancy is, in most cases, the result of a deficiency of iron and vitamins in the diet.

Pyelonephritis was the cause of death in 4 cases, 2.8 per cent.

There were 4 deaths due to chronic nephritis. The author believes that pregnancy should be terminated in all cases of established chronic nephritis as soon as the pregnancy has been diagnosed. If it is allowed to continue the patient will, in many cases, die of uremia, cerebral edema, intracranial hemorrhage, or cardiac failure. If the patient can escape these risks, she is fortunate if the pregnancy terminates prematurely at an early stage; if not, the fetus is born dead and the patient's expectation of life is materially reduced by further irreparable damage to the kidneys. Chronic nephritis is such a serious condition that sterilization should always be performed during the operation for termination of the pregnancy or shortly afterward before the patient can again become pregnant. The author's remarks relative to contraception and heart disease are equally applicable to chronic nephritis.

Four patients, 2.8 per cent, died from hyperemesis gravidarum.

Four additional patients died from pre-eclamptic toxemia. Not one of these patients had sought medical advice. Pre-eclamptic toxemia is a condition which should never reach a dangerous stage under antenatal care; had these patients received treatment their lives would have been saved.

Accidental hemorrhage was the cause of 3 deaths. It is almost always a manifestation of pregnancy toxemia and is associated in most cases with albuminuria. Albuminuria was present in each of these 3 cases. There is little doubt that had these patients sought antenatal care the toxemia would have been diagnosed and the condition ultimately responsible for death could have been prevented.

Tonic contraction and rupture of the uterus were responsible for 3 deaths, 2.1 per cent

One patient died from cortical necrosis. She was admitted to the hospital after labor had been in progress in her own home for forty-eight hours, with complete suppression of urine

One patient died from pulmonary embolism seventeen days following a classical cesarean section which had been performed for contracted pelvis

The remaining patients died from general medical or surgical conditions associated with pregnancy, namely 6 from pneumonia, 5 from tuberculosis, 3 from general peritonitis other than puerperal sepsis, 2 from asthma, 1 from thyrotoxicosis, 1 from mediastinal tumor, and 1 from debility and inanition

Adopting the standards laid down by the Departmental Committee on Maternal Mortality and Morbidity, the deaths of 91 patients, 64.5 per cent of the total number of 141 reported, indicate a primary avoidable cause

CHARLES BARON, M.D.

Irving, F. C. Maternal Mortality at the Boston Lying-In Hospital in 1933, 1934, and 1935. *New England J. M.*, 1937, 217: 693

Using the statistics from a report given by a committee of the Obstetrical Society of Boston entitled "Maternal Mortality in Boston for the years 1933-'34-'35," Irving discusses certain phases of the problems which were not brought out in the report but which were discussed at the meeting where the paper was given, in order "to clarify the situation as far as it concerns the Boston Lying-In Hospital." Furthermore, two important comparative studies were not included in the committee's reports, viz., how the maternal mortality in Boston compares with that in other cities, and how the mortality among women delivered in homes compares with that of those confined in hospitals

When the Boston report is compared with similar reports which were published by the New York Academy of Medicine and by the Committee of Maternal Welfare of the Philadelphia County Medical Society, the following death rate per thousand live births for each city is noted as follows: New York, 5.8; Philadelphia, 7.4; and Boston, 6.8. As a matter of contrast the maternal death rate in Henry County, Indiana, for the fifty-four-year period from 1882 to 1935 is cited. This gives a mortality rate of

2.5 per thousand, and in the past twenty years this rate has dropped to 1.54. It is mentioned that these women were practically all American-born citizens, one-half rural and one-half urban, but 99.5 per cent of the deliveries were conducted in the home

The Boston report stated that 21 of the 318 deaths occurred at home, 1 in a doctor's office, and the remaining 296 in hospitals. Irving calls attention to the fact that for the whole state of Massachusetts the maternal mortality is lower in hospitals than at home, and considerably lower in maternity hospitals than in general hospitals

The Boston Lying-In Hospital, in its hospital and outpatient departments, delivers one-fifth of the infants born in Boston, but only 37 or 11.6 per cent of the 318 maternal deaths occurred on this service. The maternal mortality of the Boston Lying-In service, hospital and out-patient, was less than one-half that of the rest of the city. The death rate in the out-patient department, where the patients are delivered by Harvard Medical students under supervision, was 0.3 per thousand, and over a ten-year period during which 11,330 women were delivered it was 0.35 per thousand. Only normal pregnant women are delivered by the out-patient department and the only operations performed are low forceps and multiparous extractions

All general practitioners could achieve the same excellent results, Irving believes, if they gave their patients adequate prenatal care, refrained from unnecessary interference, and called for competent consultation in the event of trouble

During the three-year period under consideration, 516 emergency cases were admitted to the Boston Lying-In Hospital. Of these 15 terminated fatally, and these constituted 42 per cent of the total of 36 deaths

Fewer patients with eclampsia are admitted now, and patients with hemorrhage are admitted more promptly. The mortality attending cesarean section, however, is appalling; the committee's report showed that 27 per cent of all deaths followed cesarean section

Irving condemns the "prophylactic forceps," "prophylactic version," and "prophylactic rupture of the membranes," and believes that such practices only prevent normal childbirth

CHESTER C. DOHERTY, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Pisani L. An Experimental Study on Potential Renal Function and a Personal Method for its Evaluation in Urological Prognosis (*Studio sperimentale sulla funzionalità renale potenziale e metodo personale per la sua valutazione ai fini prognostici urologici*) Arch ital di urol, 1937 14 409

Realizing that there is no absolutely reliable measure of potential as distinguished from static, renal function for pre operative prognosis in urological cases Pisani developed the scillaren test which represents a refinement and amplification of Schwartz and Bertolatti's technique (Strasbourg 1931 to 1932)

The method, which has been tried in 180 cases including 8 normal controls is as follows

After the patient has abstained from solids and liquids for at least six hours, a permanent catheter is inserted in the bladder or the ureters are catheterized with the usual device to prevent any mixture of urines leaking alongside the catheters. Specimens are collected with the utmost exactness every fifteen minutes until fourteen or fifteen have been taken and Amhard's constant is calculated for each. Blood samples are taken at the beginning and end of the experiment. After the fourth specimen 0.5 mgm of scillaren is given intravenously. The crucial specimen is the one collected at the acme of the diuresis. In normal persons there is a qualitative increase of function of from 48 to 60 per cent above the previous level for a short period. The tempo of the reaction is variable the grade and regularity are the important points. The advantages of scillaren are that it produces a slow and progressive but not excessive diuresis and thus reduces the errors of calculation and that it acts selectively on the parenchyma and favors the elimination of urea. Pisani is convinced that the increase of function which it produces represents the true potential function with a given stimulus

The pathological cases fell into two groups

1 The first group comprised those patients in whom the test was in accord with the clinical course. This included those whose indices were not good but whose reserve was sufficient to tide them over the operation, and the false normals who had good static functions but no reserve and in whom the postoperative course showed grave disequilibrium. The test is excellent for revealing both these types

2 In about 30 per cent of the cases in which total function was estimated the test gave unreliable or at least useless results either because of technical difficulties or because the rhythm of diuresis was so irregular that the significant specimens could not be determined. In such cases the unreliability of the scillaren test is a warning that the other tests may be equally erroneous

According to Pisani's experience in cases with deficient function operation does not involve grave risk if the scillaren test shows an improvement of more than 10 per cent. With lower figures the risk is very great and operation should be undertaken only for urgent indications

The scillaren test is also extremely useful for testing each kidney separately, especially when the excretory system of the pathological kidney is involved and hence it is of great importance in certain contingencies of conservative renal surgery. From the static standpoint it is superior to the maximal concentration test. Pisani's experience shows that when the maximal diuresis of the kidney which is to be left intact does not exceed from 15 to 20 per cent of the initial value, it cannot be relied on to sustain the necessary excretion by itself

The test demands a scrupulous technique trained personnel and laborious although elementary calculations. It is not technically possible in all cases because of mechanical or functional changes in the upper or lower urinary tract or because of an excessive polyuric reaction. Hence it cannot become a routine method but when disturbing factors are absent, it furnishes evidence unobtainable in any other way. It is especially valuable in cases on the borderline of operability

Illustrative cases are discussed and the results of the tests given in tabular form

M E MORRIS M D

Mathé C P. Intrinsic Causes of Hydronephrosis. J Urol 1937 38 574

In considering the intrinsic causes of hydronephrosis the author reviews the various obstructive lesions occurring at the ureteropelvic junction and in the upper ureter as well as the congenital type of hydronephrosis occurring at birth with or without obstructive phenomena

One group of investigators think that the greater majority of causes are obstructive phenomena while another group believe that numerous cases of hydronephrosis are congenital in nature and that there are far more of these than was formerly conceded that they exist at birth and that stones associated therewith are secondary to preexisting stasis. They believe that accessory vessels play a minor role and are a factor only in the late stages of the development of hydronephrosis and that high insertion of the ureter is a result of pelvic dilatation rather than its cause

The intrinsic causes are classified in the following manner

- 1 Congenital
 - a Congenital per se
 - b Associated with the following anomalies of the kidney and ureter
 - (1) Blind pelvis and ureter

- (2) Double pelvis and ureter
- (3) Abnormal insertion of the ureter
- (4) Horseshoe kidney
- (5) Ectopic kidney
- (6) Fused kidney
- (7) Abnormal outlet of the ureter
- (8) Aberrant distribution of the blood vessels
- (9) Stricture of the valve formation at the ureteropelvic junction

4. Acquired

- a Renal ptosis associated with obstructive bands, kinked ureter, and aberrant vessels
- b Lithiasis
- c Renal torsion
- d Stricture of the ureteropelvic junction
- e Stricture of valve at the ureteropelvic junction
- f Tuberculosis
- g Tumors of the cortex, pelvis, and ureter
- h Aneurysm of the renal artery
- i Pyelonephritis
- j Interstitial nephritis
- k Neurogenetic causes neuromuscular dysfunction, and sympatheticotonia

5. Traumatic

- a Late sequel of trauma to the cortex, pelvis, or upper ureter
- b. Following surgical interventions
 - (1) Pylotomy
 - (2) Ureterotomy
 - (3) Ureterostomy
 - (4) Surgical injuries to the ureter itself due to cutting, clamping, or tying of the ureter during operation on other organs

Hydronephrosis from congenital causes, as given in Group 1, exists as a distinct clinical entity. In this condition the associated stones are due to pre-existing stasis, accessory vessels, ptosis, and other conditions play a minor rôle and are factors only in the late stages. Valve formation and high insertion of the ureter are results of pelvic dilatation rather than its cause, although the condition commonly accompanies malformations of the kidney and ureter. In some cases of malformation of the kidney and ureter hydronephrosis may accompany the kidney anomaly at birth, in others poor drainage resulting from the malformation and a later superimposed infection may play an important rôle.

Acquired hydronephrosis resulting from mechanical obstruction at the ureteropelvic junction or upper ureter is due to renal ptosis, renal torsion, aberrant vessels, lithiasis, stricture of the valve formation of the ureteropelvic junction, renal and ureteral tumors, aneurysm of the renal artery, pyelonephritis, and perinephritis.

In rare instances hydronephrosis is due to obstruction from blood clots, sudden displacement of the kidney, and the dislodgment of pre-existing renal calculi. Traumatic sclerotic perinephritis may produce dynamic disturbances of the physiological neuromuscular function of the kidney and ureter

which result in atonic dilatation of the pelvis or in hydronephrosis because of back pressure produced by spasticity of the circular muscle of the ureteropelvic junction.

In all three types of the intrinsic causes of hydronephrosis, superimposed infection plays an important rôle.

ELMER HESS, M D

Bobbitt, R. M : Extrinsic Causes of Hydronephrosis.
J. Urol, 1937, 38 562

According to the author extrinsic causes of hydronephrosis are divided into four groups (1) aberrant polar vessels and fibrous bands, (2) diseased kidney, abdominal, and retroperitoneal conditions, (3) traumatic injuries and defective innervation, and (4) fibrosis of the ureter which is due to irradiation and involvement of the ureter from malignant growths.

Increased mobility of the kidney or some inflammatory changes around the ureteropelvic junction, or both, usually is the inciting factor in hydronephrosis caused by aberrant polar vessels. Fibrous bands or adhesions have been found in a very small percentage of cases.

Trauma to the kidney and surrounding structures as well as the perirenal infections plays an important rôle in hydronephrosis. Movable kidney does not produce the condition unless associated with marked kinking, aberrant vessels, or fibrous bands. Inflammatory masses in the female pelvis are not an uncommon cause. Ovarian cysts and uterine fibroids may cause obstruction from outside pressure. Carcinoma involving the female pelvis is a common factor and renal insufficiency from back pressure and infection is a contributing factor in the majority of deaths from this disease.

Following trauma, fixation of the ureter to the peritoneum with increased mobility of the kidney and obstruction is not infrequent, injury to the local nerve supply may affect the normal peristaltic action and render a minor extrinsic obstruction very serious, injuries to the spinal cord may cause atony of the entire urinary tract, with infection and stone formation, and in many of these cases the patients die of renal insufficiency. Injuries to the ureter during abdominal and pelvic operations must not be forgotten. There is no doubt that neuromuscular conditions play an important rôle. Any process that destroys the ganglia or the connecting fibers to the muscle layers of the ureter is certain to produce atony.

Fibrosis of the lower ureter due to radium therapy in malignant conditions in the female pelvis and prostate gland causes hydro-ureter and hydronephrosis in a much larger percentage of cases than has ever before been noticed. Seminal vesiculitis and retrocecal appendicitis may also produce hydronephrosis.

Case reports are appended illustrating each of the different types of extrinsic causes of hydronephrosis. It must not be forgotten that both extrinsic and intrinsic causes may co-exist.

ELMER HESS, M D

Hepler, A. B. Intrarenal Changes in Hydronephrosis. *J Urol* 1937, 38 593

The structural changes which occur in a kidney as a result of urinary back pressure known as hydronephrotic atrophy, are essentially the same whether the obstruction is complete or partial permanent or temporary, high or low. The difference in their development is simply one of rate and degree.

The usual effect of complete ureteral obstruction is a progressive hydronephrotic or pressure atrophy of the kidney. Occasionally there may be a primary atrophy from anuria without hydronephrosis although this has been found only a few times and then was associated with severe infection.

The hydronephrosis which follows complete blocking is progressive and is proportionate to the duration of the obstruction other factors being the same. This condition is unique among secreting organs whose ducts are totally obstructed and its development depends on a continuing urinary secretion. This in turn depends on an outflow or reabsorption of the pelvic contents. If after complete block there was no outlet urinary secretion would stop when the glomerular or secreting pressure and the intrapelvic pressure had reached their heights and were equalized and a primary atrophy of the kidney would follow. There has to be a counterplay between urinary secretion and pelvic absorption at such rates as to permit secretion to continue and yet to maintain an intrapelvic pressure that is sufficient to produce the effects known as hydronephrotic atrophy.

Experiments were conducted and elaborated upon by Morrison who concluded that there were two main routes of absorption in hydronephrosis—lymphatic and tubular. Lymphatic absorption was active for the first two or three days then tubular absorption commenced and continued more actively than the lymphatic absorption. Prelovenous backflow is usually the result of trauma and therefore is not regarded as a factor.

A series of experiments was undertaken and the results indicated that circulatory disturbances were of great importance in hydronephrotic atrophy and that hydronephrosis developed much more rapidly when circulatory disturbances were present. Following relief of the obstruction there was improved circulation with improved function and hypertrophy of the less damaged glomerulotubular units. The repair like the damage is not uniform and diffuse but shows a group distribution.

The changes in hydronephrotic atrophy are constant but the rate of development and the degree of hydronephrosis will vary with the location and type of the obstruction while infection may profoundly modify the development of hydronephrosis and the process of repair. In the early stages it may cause a primary atrophy without hydronephrosis in the later stages it may produce a secondary atrophy and shrinkage. It may also hinder the process of repair after the relief of obstruction.

ELMER HESS M.D.

Braasch W. F. Clinical Data Concerning Chronic Pyelonephritis. *J Urol* 1938 39 1

A working knowledge of the bacteriology concerned in infection of the urinary tract is essential to its intelligent treatment.

Although with renal infection some bacteria may cause clinical and pathological signs which are characteristic any of the various bacteria may cause the complications and pathological changes which may occur. Although pathological changes resulting from various types of bacteria are in general similar infection with aerogenes and proteus is often more resistant to therapy and often causes more wide spread involvement of the submucosal tissues than infection with other bacteria. Although all bacteria may cause mild symptoms and but little deformity this type of infection is observed relatively more often in the presence of cocci than of other bacteria. Mixed infection may occur and often requires persistent and intelligent treatment in order to eradicate the various types of bacteria.

Amicrobial pyuria is present in more than 30 per cent of cases of chronic pyelonephritis. Although a specific organism may be present in some cases in most cases the bacteria have become so indolent and scattered that they fail to appear in cultures. Anaerobic bacteria are only occasionally of etiological importance.

The pH of the urine is not of much diagnostic importance in renal infection unless it is distinctly on the alkaline side. Knowledge and adjustment of it is however essential to intelligent treatment with mandelic acid and in ketogenic therapy and to a less extent in other forms of chemotherapy.

Lithiasis secondary to chronic pyelonephritis is a distinct type of renal lithiasis. It occurred in 5 per cent of a series of cases encountered at the Mayo Clinic. It is attended by roentgenographic signs which may be characteristic. Its origin is apparently not the result of the urea splitting action of bacteria since the pH is usually in the range of neutrality. It causes comparatively few renal symptoms or complications in most cases and usually does not affect the course of the infection over a period of years. All types of bacteria may be concerned.

Renal hematuria secondary to pyelonephritis occurs in 12 per cent of cases. It is usually a late complication and is caused by granulomas or areas of superficial ulceration in the mucosa of either the pelvis or ureter very often in the latter. Often it can be stopped by controlling the infection with chemotherapy or by means of pelvic lavage. Its occurrence is apparently not related to the species of bacteria or to the pH of the urine. All types of bacteria are concerned although in the majority of cases aerogenes and colon bacilli are present.

Urographic deformity which accompanies chronic pyelonephritis and which is regarded as characteristic consists of caliectasis and ureterectasis with cicatricial narrowing of the infundibula and of the renal pelvis. The outline of the dilated calyx is usually more irregular in the presence of infection.

than in the presence of obstruction. The dilatation of both ureter and calyces usually is adynamic in character. On the other hand, pyelectasis, which is of comparatively infrequent occurrence, is likely to be the result of obstruction. Dilatation of the ureter is usually of greater diagnostic importance than dilatation of the calyces. Adynamic or atonic ureterectasis may be explained by periureteritis affecting the trophic nerves which supply the ureteral wall. In view of the marked ureterectasis and angulation of the ureter so frequently observed, it is noteworthy how seldom actual constriction of the ureter is found. The degree of deformity is not necessarily dependent on the duration or the degree of infection, but more on the extent of submucosal invasion. Although all types of bacteria are concerned, less deformity usually is seen in the presence of coccal infection than in the presence of infection with other bacteria. The greatest deformity is observed when the infecting organisms are aerogenes or proteus. The excretory urogram often is misleading in that it fails to visualize the deformity in the calyces and in the ureter.

Removal of foci of infection in cases of chronic pyelonephritis is not so efficacious as it is in cases of acute infection. Such foci may have a direct bearing on persistent prostatic infection, and should be removed. Prostatic infection often prevents eradication of pyelonephritis and requires specific treatment. Sulfanilamide promises to be a valuable adjunct to prostatic treatment.

Nephroptosis is seldom a factor in causing chronic pyelonephritis. When renal stasis is present it is usually recognized by clinical and urographic signs, and surgical intervention may be necessary. However, such intervention is required in only a small proportion of cases of chronic pyelonephritis.

Since recovery from chronic pyelonephritis is spontaneous in fully 20 per cent of cases, too much credit must not be assumed for various methods of treatment which have been employed.

It is surprising how seldom complications which require surgical operation appear. Surgical treatment is not usually indicated unless one of the following is present: some form of obstruction, localized, persistent infection, destruction of renal function, or atrophy. Such treatment was found necessary in but 3 per cent of the 526 cases of chronic pyelonephritis observed at the clinic in the past seven years.

In the recent developments of chemotherapy, compounds have been produced which have given startling results. The author refers particularly to sulfanilamide and mandelic acid. Although sulfanilamide gives promise of being a potent factor in eradicating renal infection in many cases, in common with other similar drugs, it is of greater value against acute than against chronic infection. There is a vast difference in the results obtained in the treatment of chronic and of recent renal infection. Although most renal infections when acute, subacute, or recurring can be controlled by recently developed chemotherapy, nevertheless when the infection be-

comes chronic, secondary and anatomical changes often will defy all treatment.

Eradication of chronic pyelonephritis will be possible by prophylaxis and by thorough, intelligent treatment of acute and subacute infection. Treatment of urinary infection still demands the intelligent supervision of the urologist.

In no field of medicine has there been finer international co-operation in the solution of mutual problems than in that of treatment of renal infection. In keeping with the intentions of the worthy founder of these lectures, Braasch trusts that the members of this society will increase their efforts to promote further international co-operation.

GENITAL ORGANS

Dencks: Prostatic Surgery (Prostata chirurgie). *Zentralbl f Chir*, 1937, p 2161

The author called attention to the perplexity still existing at this date, regarding the treatment of prostatic hypertrophy. In three years, in the New Cologne Hospital (Neukoellner Krankenhaus), 173 patients were treated for hinderance to urination, 90 were in such poor health that an operation could not even be considered. Of the remaining 83, 21 were afflicted with serious kidney disease that contra-indicated extirpation. Prostatectomy was done in 62 cases, followed by 8 deaths. The greatest importance is attached to the pre-operative treatment, especially to the strengthening of the heart and to the establishment of better renal function. The permanent catheter is the dominant remedial agent. A suprapubic fistula should be made only when a severe cystitis or stricture exists, or when the catheter cannot be tolerated. The pre-operative treatment requires two months at the most in the severest cases, but generally much less time is required. The examination of the kidneys consists of estimation of the blood pressure and the residual nitrogen in the blood, of Volhard's test, and, frequently, pyelography. Dencks considers prostatectomy the best treatment for all patients in whom the results of the kidney examinations do not contra-indicate a major procedure. He uses lumbar anesthesia exclusively. Drainage of the prostatic area is established suprapubically with invaginating sutures around the cystic drain. This is sutured with catgut to the indwelling catheter and both drains are provided with apparatus for aspiration, frequent flushings are then done. Prophylactic vasectomy is discarded by the author, as the patients complain about the two-stage operation, a mild epididymitis occurred very infrequently. As for the remaining patients, electrocoagulation with notching was just as unsatisfactory as deep roentgen-ray treatment, but electrosectioning showed definite progress. This was done 22 times in 18 patients and resulted in 3 deaths. Autopsy showed that the deaths were caused by severe purulent pyelonephritis. This method is not entirely harmless. The pre-operative treatment is the same as for prostatectomy. The

number of cases which may be treated by operation has been increased by the use of this method, but it is too early to consider the permanent cures resulting from it. Dencks prefers the Rubrinius wedge shaped excision of the sector alia in cases of splinter fixation or hypertonia. In a case treated by resection carcinoma of the prostate was found microscopically. Dencks' conclusions are that every case of prostatic hypertrophy can be entirely cured without risk, if it is put into the hands of a competent surgeon at an early stage of the disease.

In the discussion WILDEGA is emphasized the fact that only one third of the patients are in condition to withstand a prostatectomy. He called attention to the necessity of pre-operative treatment. The best results he obtained were in the cases with involvement of the median lobe. He feared prostatic hemorrhage more than infections. The technique of resection depends greatly upon proper functioning of the electric apparatus. Endometrial resection is a substantial contribution to this therapy.

HINZ is of the opinion that a purely surgical procedure still falls short of the desired result. He called attention to the disparity in the postoperative mortality statistics as the patients brought to operation are not all in the same physical state.

GOETTMANN emphasized that the presence of carcinoma could not be ascertained by resection. In the preliminary examination, the Volhard test was decisive in his estimation. He gives no credit to pyelography and attaches as little importance to the residual nitrogen in the blood. He operates under lumbar anesthesia.

NORMAN strives for the radical removal of the prostate especially because obviously marked inner secretory disturbances obtain so long as the diseased gland remains in the body. He does the two stage operation. He obtained the best results from determination of the residual nitrogen in the blood.

KATZEL has not as yet been able to decide upon electroresection. He called attention to the history of the Bottini operation which basically represents the same procedure. After operation the patients are afflicted with relapses and residual urine as the adenoma keeps on growing. He fears that this method may be productive of much harm as cases of early carcinoma that could be saved by radical operation are lost. The last method is prostatectomy; the only stipulation is that the patients should be referred early for operation.

HINZ believes that with reference to prostatectomy the value of fractional renal diagnosis is overestimated. The operative decision rests solely upon a prolonged pre-operative test for the kidneys supported by internal treatment of the pyelitis.

STAAL called attention to the fact that the test for residual nitrogen in the blood is something entirely different from the Volhard test and that operation should be done only if both tests give favorable results. He does not believe in abandoning the establishment of a cystic fistula in favor of the use of the indwelling catheter.

WILDEGA is not wishing to be misunderstood stated that the prostatectomized patient is the most fortunate as he is really cured.

HINZ asked where and how much resection should be done, the opinions are far from uniform.

Dencks in closing reiterates that he too still considers prostatectomy to be the best procedure. He observed rather severe cystitis in the patients whom he subjected to electroresection.

(JANSEN) MATTHIAS J. SPICERT M.D.

Schroeder C. H. Experiences with Electrotomy in Prostatic Hypertrophy (Erfahrungen mit der Elektrotomie bei Prostatahypertrophie). *Arch f. Klin. Chir.* 1937 190: 1-4.

Schroeder discusses the indications, preparation after treatment, operative technique and results of electrotomy for prostatic hypertrophy on the basis of the material of Coenen's Clinic. The indications for electrotomy of the enlarged prostate are extended beyond those commonly accepted (sclerosis of the sphincter, formation of transverse bars and valves and enlargement of the middle lobe) to include also high grade hypertrophy of both lateral lobes or of all three lobes, whether of subcapsular or intracapsular type. The time for operation is considered to have arrived when by suitable preparatory treatment, the residual nitrogen of the blood has been brought down to less than 40 mgm per 100 ccm of blood. No contraindications are seen in slight to moderately severe inflammations of the bladder which respond well to treatment so long as the residual nitrogen does not increase beyond 40 mgm per 100 ccm in mild forms of diabetes mellitus and cardiovascular disturbances of medium severity. Prostatic carcinomas also are treated by electrotomy. The preparation consists in irrigations of the bladder with silver nitrate solution, argolaval and rivanol in the administration of fluids by mouth and the administration of urinary disinfectants until the residual nitrogen has sunk below 40 mgm per 100 ccm and Volhard's concentration test shows values of at least from 10 to 102. Patients with prostatic disease with more than 200 ccm of residual urine and beginning or pronounced renal insufficiency receive the indwelling catheter. In older patients especially and patients with high grade hypertrophy which requires prolonged employment of the indwelling catheter division of the spermatic cord is practiced. Parasacral anesthesia is preferred. In the last few years the operative technique has been altered so as to permit larger resections. The technique is as follows:

First resection of the middle lobe is done, if one is present. It is frequently this resection which first allows the constriction of the urethral lumen by the protruding lateral lobes to be seen. A strip from 2 to 2.5 cm long is resected from the lateral lobes which results in the formation of a gully that is later flattened out. In the removal of large strip the cutting is done in a distal direction, as a rule cutting is toward the bladder only for the clearing up of

small shreds of tissue running into the bladder from the site of the tissue coagulation. The apparatus must be so set that the coagulation is limited to the superficial tissues, the cutting strength of the current is correctly regulated when the color of the cut surface of the tissue fragments is a rosy gray. In the after-treatment a catheter is employed until the urine is macroscopically free of blood, but not longer than five days. When the catheter is removed, the bladder is filled with a 1:1000 solution of silver nitrate, which the patient evacuates naturally. Secondary hemorrhages are rare, but they occur occasionally and require either perivesical coagulation or removal of the entire prostate. In all, 73 patients were treated. The results were better after the practice of limiting the amount of tissue resected to 2 c cm. at most had been replaced by that of resecting from 5 c cm. to 15 c cm. in one or two stages. Of the 40 patients treated according to the former practice, 70 per cent were benefited or cured from two to four years after the operation. Of these, 15 per cent were cured and had no residual urine, 37.5 per cent were much benefited and had a residual urine of less than 50 c cm., 17.5 per cent were benefited but still had occasional symptoms and a residual urine of from 50 to 100 c cm.; 10 per cent were not benefited, and 20 per cent died before the follow-up examination. Of the patients treated by resection of larger quantities of prostatic tissue, 91 per cent were cured or benefited on discharge. The operative mortality of this group was 3 per cent. It is yet too early to speak of the permanent results in this latter series of patients.

(WERNER BLOCK) FLORENCE A. CARPENTER

Burnam, C. F.: The Use of Radium and Roentgen Irradiation in Benign Hypertrophy and Cancer of the Prostate. *Am J Roentgenol*, 1938, 39: 75

The author gives a rather extensive review of the literature and quotes the statistics of others using various methods of treatment. His own series of 158 cases were treated chiefly by telerradium at a distance of from 7.5 to 10 cm. and given through multiple portals. A total dosage of from 100 to 300 gm. hours was given within from two weeks to three months, the variations depending upon the condition of the patient. About 30 cases were treated by telerradium combined with some other therapy.

From his observation Burnam concludes that the prostatic cancers vary greatly in their sensitivity to radiation and in their malignancy. Cross-firing with radium at a distance or with roentgen rays, is the most valuable palliative method at present. In cases of obstruction, not promptly relieved by irradiation, electrosurgical resection is indicated, followed by more irradiation.

THOMAS P. GRAUER, M.D.

Hinman, F., and Powell, T. O.: The Management of Tumor of the Testicle. *J. Am. Med. Ass.*, 1938, 110: 188

Fifty-eight cases of tumor of the testis were analyzed and the tumors grouped according to a histo-

logicohormonal classification. In 2 unusual cases of primitive tumor the urinary hormonal titer reached 1,000,000 mouse units per liter. The steps to be followed in the logical management of tumor of the testis are: (1) consideration of the clinical history, (2) physical examination, (3) hormonal test of the urine, (4) orchidectomy, (5) histologicohormonal classification of the tumor, (6) prognosis, and (7) subsequent treatment.

The six steps which have been given in the management of tumor of the testicle cover the treatment of this condition up to the point of subsequent treatment, since the cure of the patient is kept in mind throughout. Early diagnosis and prompt orchidectomy offer the surest cure. The procedures to be followed afterward depend on the results. In the absence of demonstrable metastases and of the gonadotropic hormone previously present, further treatment at the time is not indicated. The patient is advised to return periodically, every three months, for physical examination and a hormonal test of the urine. With the appearance of metastases clinically or the recurrence of the hormone in the urine, treatment should follow the indications given by the histological classification of the tumor correlated with the series of hormonal tests up to this time.

When metastases can be observed clinically, radical surgical treatment of any kind is useless and intensive irradiation alone is indicated. When metastases cannot be demonstrated clinically and the hormonal test remains positive or becomes so after orchidectomy, the most probable location of the metastases is in the primary and secondary lymph zones of the testicle. If the tumor is radiosensitive, as shown by its histologicohormonal classification, this area should be intensively irradiated. If the probable response to irradiation of the metastases presumed to be in the primary lymph zone is estimated by the foregoing classification to be only fair or poor, then after irradiation an attempt to remove the lymphatic area radically should be made. Radical operation was performed on only 3 of the 58 patients included in this report. All are living and well, one seven years, one three years, and one two years after the operation, no metastases were found clinically and the hormonal tests were negative.

The absence of chorionic elements, when all the other features are so similar, seems to indicate that primitive tumors, whether mixed or not, are essentially the same biologically. This relationship is not found in the more adult and differentiated types of the two kinds of tumors. The differentiated non-mixed tumors behave differently from the more differentiated mixed-cell tumors containing embryonal malignant elements. The fully differentiated non-mixed tumor (seminoma) without hormonal excretion apparently affords a poorer prognosis than the most differentiated embryonal carcinoma, which is similar to it histologically but causes hormonal excretion, the adult mixed tumors without hormone are practically benign as compared with the more differentiated or adult-like teratomas with hormonal

excretion The latter condition indicates a poor prognosis
C. TRAVERS STEWART M.D.

MISCELLANEOUS

Anderson O. L. and Harms O. Lymphopathia Venereum Treatment with Diluted Frei Antigen Given Intradermally and Observations on Diagnosis Surgery 1938 3 41

Lymphopathia venereum is a venereal disease which attacks the lymph channels and nodes. It is not at all similar to lymphogranuloma inguinale and it occurs among both the white and colored races, though the preponderance of cases of this disease occurs in the colored race. It is not peculiar to the tropical climates.

The causative agent is a filtrable virus which is almost always transmitted during sexual contact.

The initial lesion is transitory, heals spontaneously, and the patient's first knowledge of his disease occurs at the time a bubo makes its first appearance or in the case of a female when rectal stricture and ecthiomene occur. After an incubation period of from ten days to three weeks, rarely six weeks postcoitus, the patient notes a swelling of the inguinal glands which may be mild or severe. The constitutional symptoms are chilliness, lassitude, pains in the joints and muscles, headache, nausea, mild anemia, and loss of weight. Skin manifestations such as erythema multiforme or erythema nodosum, may occur. The spleen may be enlarged. A temperature of from 102° to 104° is not rare and may persist for several weeks, continued quite likely by the involvement of new nodes.

The disease, as it is seen in the female, usually takes on a quite different aspect, because of the difference in the lymph drainage in the two sexes. While an inguinal localization may occur, it is rather rare. The process is more prone to spread to the deeper pelvic nodes and to the lymph nodes around the lower part of the rectum as the result of an inoculation of the virus upon the posterior surface of the vaginal mucosa or the posterior lip of the cervix. The infection, as a rule, leads to lymphatic stasis and inflammatory rectal stricture and the

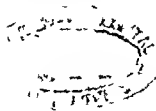
lesion may be associated with the formation of one or more fistulas. Primary infection at the vulva or perineum may set up an extensive edema and in duration between the vulva and anus. The disease must be differentiated from chancroid, syphilis, Hodgkin's disease, and tuberculosis, and the prognosis is good except when the anorectal syndrome prevents itself.

A positive Frei test, when properly interpreted, is most helpful. It is performed with an antigen containing the heated virus of the disease, of which there are three main sources: pus aspirated from a bubo, macerated material from a diseased gland, and the serum of a susceptible animal inoculated with the virus.

The technique consists of intradermal injection of 0.1 c.c. of the antigen. A papule 0.6 to 0.9 cm. in diameter is positive; a papule larger than 0.9 cm. in diameter is strongly positive; a papule 0.5 cm. in diameter is doubtful. The Frei test will not be found positive until a period of from three to eight weeks has elapsed from the time of infection.

The treatment that seems to be of the greatest value is the intravenous or intradermal use of Frei antigen. This antigen is combined with antimony and potassium tartrate. The authors use the intradermal administration of the vaccine and they believe that the value of the Frei antigen, especially in early cases and when given intradermally, is a great therapeutic advancement. They found the sterile and potent Frei antigen, diluted four times, an effective agent. The antigen is given every five days and the initial dose is 0.05 c.c.m., which is increased at each dose by 0.05 c.c.m., up to the maximum dose of 1 c.c.m. The treatment is continued until the sinuses heal and the adenopathy subsides, or if a lymphadenectomy was performed until the wound heals. It is estimated that from 6 to 12 doses of the pus vaccine are required. Up to the present time the authors have used autogenous or heterogenous Frei antigen derived from a single case. They now plan to make up their next vaccine from different pooled Frei antigens which, according to their belief, may be even more effective.

ELMER HESS M.D.



SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Derižanov, S. Experimental Osteomyelitis (Die experimentelle Osteomyelitis) *Chirurgja*, 1937, 4, 16, 5 17

First there is given a review of the old and the new experiments attempting to produce experimental osteomyelitis in animals. These experiments consisted of the injection of bacteria into the circulation or directly into the bone marrow. Some which combined the injection with trauma and some with lack of vitamins produced only abscesses in joints and bones as a local manifestation of a generalized septic infection from which nearly every animal promptly died. The author was unable to produce an experimental lesion similar to the human subacute or chronic osteomyelitis. He then describes the basic principles and the special histological aspects of allergic inflammation which may be produced by previous sensitization. He explains his own research, in which it was possible by means of sensitizing dogs with horse serum and procedures of a similar sort to produce a slowly progressive form of osteomyelitis localized in a single bone. The two main series included 54 dogs. After sensitizing these dogs with repeated subcutaneous injections of horse serum, an exciting dose of from 2 to 3 c. cm. of horse serum was injected into the marrow of the tibia.

In the second series, the same exciting dose of horse serum was injected into the bone marrow twenty days after exactly the same preparation but with the injection of 500,000 bodies of staphylococcus albus in an emulsion with 1 c. cm. of distilled water. The bacteria came from a localized area of osteomyelitis in a man.

As a control for the first series 10 animals were injected with from 2 to 3 c. cm. of horse serum into the marrow of the tibia without previous sensitization. These control experiments proved to the author that such an injection was productive of no tangible results.

In the main experiment of the first series in which the injection of serum into the bone marrow had been preceded by sensitization of the animals, the results were remarkable and could be followed and fixed by the x-rays. Changes recognizable with the x-rays could be ascertained as early as the twentieth day after the exciting dose. The change arose at the place of the trephining of the bone as a shadow about 2.5 cm. long, which week by week and month by month increased in length and breadth, and finally, after a year or more, involved the whole bone. Later there appeared great irregular areas of absorption and deposits of bone about the periosteum which could be recognized as the changes of osteomyelitis in man. Histologically areas of necrosis could be recognized in the bone marrow as soon as two hours

after the exciting dose. Later came decalcification of the bone and formation of sequestra and granulation tissue. Spots of hemorrhage appeared and later proliferative changes in the connective tissue elements of the bone marrow. The described process did not remain limited to the bone marrow but spread along the Haversian canals to the periosteum. In short it may be said that an aseptic osteomyelitis and periostitis very similar to the chronic forms of bone disease in man appeared.

In the second series with an interval of twenty days before sensitization with horse serum, in which, however, the exciting injection consisted of a mixture of pure horse serum with staphylococcus, there developed throughout similar changes, only that in one case there was a collection of pus and fistula formation. The secretion from this fistula contained staphylococci. Histologically one could also recognize in this series necrotic spots, areas of hemorrhage, stasis, serous inflammation, and fibrinous-like swelling of the connective tissue and vessel walls. The diagnostic signs of the allergic inflammation in the first series even outweighed those of the pyogenic inflammation in the second series. These experiments show that in the pathogenesis of experimental osteomyelitis, not the bacterial embolus, nor the high virulence of the organism but the allergic condition of the organism is of the most importance.

HAWTHORNE C. WALLACE, M.D.

Derižanov, S.: Experimental Osteomyelitis (Experimentelle Osteomyelitis) *Chirurgja*, 1937, 6 10

In the first two research series the author used rabbits previously sensitized by several injections of 5 c. cm. of horse serum at three-day intervals. Subsequent intra-osseous introduction of a serum containing cocci resulted in an acute "monossale" osteomyelitis, while an equivalent dose of attenuated staphylococci produced a chronic, progressive form.

In the third series the animals were not sensitized with pure horse serum, but with horse serum containing staphylococci, the exciting dose remained the same as in the preceding series. All these animals succumbed to sepsis, and only 2 lived longer than one month following the exciting dose. All animals developed suppurative joints, but only the 2 which lived longer had demonstrable bone changes in the roentgenogram.

Finally, in the fourth series, of 10 rabbits, the animals were again sensitized with normal horse serum, eight days later, an exciting dose, consisting of 5 c. cm. of serum plus 500,000 bacteria of the staphylococcus albus type emulsified in 1 c. cm. of water, was injected subcutaneously. Before the introduction of this dose the animals were struck upon the tibia with a wooden club. As a result 8 animals went into anaphylactic shock, 2 lived longer and after twenty-eight days developed suppurative

osteomyelitis of the metaphysis of the tibia at the site of trauma apparently without a systemic infection

Neither the high virulence nor the large number of bacteria is of great significance in the production of experimental osteomyelitis but rather the particular susceptibility of the body which can be augmented experimentally by sensitization

(N. PETROV) JEROME G. FINER M.D.

Swett P. P. A Review of Synovectomy *J. Bone & Joint Surg.* 1935 20 68

Synovectomy is an operation for the removal of diseased synovial membrane from a joint which is the seat of an inflammatory reaction. The operation is applicable to any joint of the extremities. The purpose of the operation is to improve the integrity of a joint when there is reason to suppose that the continued presence of synovial inflammatory changes will add to the damage or when it seems likely that the operation will increase the function of a joint and favorably influence the general health of the patient.

There is clinical and experimental evidence that synovectomy is followed by a restoration of the synovial tissue or by development of a substitute which is functionally satisfactory.

The indications for synovectomy cannot be given categorically and should not be stated dogmatically. It is an operation of election and every risk that might increase the patient's burdens should be avoided. Synovectomy should not be attempted in debilitated actively febrile patients or on those with profound organic disease or on the delicate sensitive individuals with poor emotional stability when there is reason to suppose that neither the idea nor the accomplished fact will be borne well. There is no indication for doing a synovectomy when the proliferation has progressed to the extent of severe cartilaginous ulceration and absorption as shown by material reduction of the joint space in the roentgenogram. The purpose of the synovectomy is to prevent severe damage of the joint and it is impossible to improve the mechanics of a joint by synovectomy when much damage has occurred. The operation should be done early or at such time when it is obvious that the process is not receding or when proliferation continues in spite of other therapeutic measures.

A synovectomy is indicated in a joint with extensive induration and thickening of the capsule, enlargement of the synovial villi and persistent increase of the joint fluid. The best results can be expected in those cases in which the damage is entirely synovial. A synovectomy may be satisfactorily employed in chronic atrophic arthritis, traumatic arthritis, benign tumors, osteochondromatosis, syphilitic arthritis, intermittent hydrarthrosis and synovitis occurring as a result of irritation of a foreign body.

The approach to a joint for a synovectomy should always be done through the extensor surface usually

by way of a single longitudinal incision. In most instances the object is to do as little as will as ure the needed benefits. It is a mistake to do a complete synovectomy in every instance. The dissections should be as complete as possible in tuberculous benign tumors and in syphilis but not in atrophic arthritis and in the other conditions listed. Removal of sections of synovia at intervals in an atrophic arthritic knee will yield full benefits and lessen the risk of postoperative fibrosis.

The author emphasizes that he has never seen a case of hypertrophic arthritis in which a synovectomy was indicated but states that in some instances it may be.

ROBERT P. MONTGOMERY M.D.

Radulesco A. D. and Suzan B. The Kyphosis of Tetanus (*La cyphose tétanique*) *Rev. d'orthop.* 1937 24 578

Spinal deformities following tetanus were first reported in 1915 by Walther since that time only a few cases have been reported. In Roumania 2 cases of kyphosis following tetanus were reported in 1918. Radulesco and Suzan now report 2 other cases observed in Radulesco's clinic in Cluj. These 2 cases both occurred in children twelve and fourteen years of age who had had a severe form of tetanus with frequent spasms. Within a few months after recovery from the tetanus pain and kyphosis developed in the thoracic region. In 1 case the diagnosis of Pott's disease had been made. In 1 case the fourth to the eighth thoracic vertebrae were involved, the gibbosity being formed by the fifth and sixth thoracic vertebrae. In the other case the second to the ninth thoracic vertebrae were involved with the gibbosity formed by the fourth, fifth and sixth thoracic vertebrae. In both treatment was begun by extension in a suitable orthopedic apparatus; this was followed in 1 case by mechanotherapy and massage and in the second case by a fusion operation with an autogenous bone graft from the rib (Radulesco's method). The results in both cases were excellent.

In both these cases the roentgenograms showed a thickening of the vertebrae forming the projecting gibbosity with a decalcification of vertebrae below and above it. From these findings the authors conclude that the formation of the deformity occurred in three stages: decalcification, formation of the gibbosity and recalcification of the vertebrae in the projecting portion. There was no obliteration of the intervertebral spaces. In contrast to the kyphosis of rickets or of Pott's disease the kyphosis of tetanus reaches its maximum deformity rapidly and remains stationary after that even if not treated.

The primary decalcification of the vertebrae in these cases is to be attributed to the tetanus acidosis, the direct action of tetanus toxin or circulatory disturbances. The decalcification undoubtedly occurs during the course of the active disease diminishing the resistance of the vertebrae; the attitude of the patient and the muscular spasms play a rôle in producing the deformity which later becomes more marked.

ALICE M. MEYERS

FRACTURES AND DISLOCATIONS

McMaster, P. E.: The Principles of Treatment of Compound Fractures *Am J Surg*, 1937, 38 468

The author presents certain principles of treatment based on a study of 356 cases of compound fractures, the majority of which were treated at the Los Angeles County Hospital. He believes that the three major problems presented in the care of these cases are (1) treatment of shock, hemorrhage, and internal injuries, (2) care of the injury of the soft parts at the fracture site, and (3) treatment of the fracture. Shock is combated by external heat, morphine, and intravenous fluids. Tetanus antitoxin should be given routinely and polyvalent gas-gangrene antitoxin in certain cases. He reports 49 cases of gas-bacillus infection with 24 amputations and 9 deaths. As soon as possible adequate débridement of the compound fracture should be done after meticulous preparation of the skin. The wound should be thoroughly irrigated with saline solution. The wounds treated from six to eight hours after injury are closed without drainage, while those from eight to ten hours old are closed loosely to allow for wound drainage. Wounds more than ten or twelve hours old are packed open with vaseline gauze after excision of the traumatized or necrotic tissue. Internal fixation with metal plates, screws, and wires is not advisable.

BARBARA B STIMSON, M D

Gordon, D.: Fractures of the Upper End and Shaft of the Humerus *Am J Surg*, 1937, 38 495

After discussing the general problem of emergency fracture treatment, the author presents in detail the clinical examination of a patient with a shoulder injury and then describes his methods of treatment of various fractures of the upper extremity and shaft of the humerus. He believes in excision of the displaced humeral head after fracture through the anatomical neck because of the destroyed blood supply to the head. For undisplaced fractures of the surgical neck he advises sling and swathe, for displaced fractures reduction under an anesthetic, if this is not possible, either skin or skeletal traction parallel to the body. He describes an ambulatory form of traction which he has found satisfactory. Radiant heat with the gentlest massage is useful, and active exercise as soon as possible is essential. Illustrations accompany the article.

BARBARA B STIMSON, M D

Eliason, E. L., Brown, R. B., and Kaplan, L.: Fractures in the Forearm—Except Colles'. *Am J. Surg*, 1937, 38 511

After stressing certain cardinal principles of all fracture treatment, i.e., (1) promptness, (2) thoroughness of reduction, (3) gentleness, and (4) individualization, the authors discuss the diagnosis and treatment of fractures of the forearm.

Olecranon fractures with wide separation require open operation as a rule, while those with slight separation are best held in extension with an anterior molded splint. Fractures of the shaft alone



Fig 1 Positions of surgeon (at the head) and of assistant for the reduction of fractures of the shafts of the forearm bones (Courtesy of *Am J Surg*)

should be manipulated and held in molded splints or an unpadded cast applied after subsidence of the swelling. Fractures of the upper extremity of the radius should be fixed on a right angled splint for at least ten days. Removal of a displaced fragment may be necessary. Fractures of the radial shaft alone should be reduced under an anesthetic and held in molded splints or unpadded plaster. Open reduction is often necessary in these cases. Fractures of both bones may be reduced by manipulation, but may require open operation if reduction cannot be obtained or maintained, or if there is interposition of the soft parts. In most cases it is wise to fix the fingers for at least ten days to prevent displacement of the fragments by muscle pull. The authors believe that in the after-care the patient is his own best physical therapist.

BARBARA B STIMSON, M D

Rider, D. L.: Fractures of the Metacarpals, Metatarsals, and Phalanges. *Am J Surg*, 1937, 38 549

The author describes the causes, anatomy, and treatment of fractures of the phalanges, metacarpals, and metatarsals.

Fractures of the distal phalanx can frequently be treated simply by tongue depressor splints. If, however, the fragment is at the attachment of the extensor tendon, continuous hyperextension is necessary for a prolonged period. Fractures of the middle and proximal phalanges should be immobilized frequently in flexion. Fractures of the metacarpals should not be immobilized by a roller bandage which tends to increase the deformity; molded plaster splints should be used. Bennett's fracture may be held by placing the thumb in wide abduction and incorporating thumb, wrist, and forearm in a snug cast.

The author describes various types of continuous traction and believes that this method is very useful for both hand and foot injuries. He found: that the healing time of these small-bone fractures

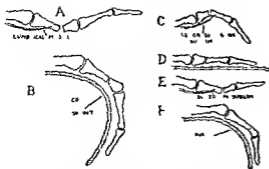


Fig 1. Diagrammatic representation of fractures of the proximal and middle phalanges showing characteristic deformities. A fracture of the proximal phalanx. The common deformity is one of angulation toward the palmar surface. This is due to the pull of the lumbrical muscle. B illustrates the reduction by flexion. The position is maintained by a curved splint made of light metal or plaster of Paris. Flexion may be increased sharply if the palmar angulation is acute. C fracture of the middle phalanx proximal to the insertion of the flexor digitorum sublimis. Note the angulation toward the dorsum due to bow string action of the tendon. D the same fracture reduced and held by a straight splint made of a wooden tongue depressor. E fracture of the middle phalanx distal to the insertion of the flexor digitorum sublimis tendon. Note the angulation toward the palm. The flexor tendon in this case acts as a 'guy rope' rather than a bow string. F the same fracture reduced and position maintained by immobilization on a curved splint. (Courtesy of Am J Surg)

is considerably longer, as shown by roentgen ray studies than is commonly supposed and may account for the prolonged pain in certain cases in which function is resumed too early. He believes that 'march foot' may be much more common than has been supposed. BARBARA B. STIMSON M.D.

Jahss S. A. Fractures of the Metacarpals. A New Method of Reduction and Immobilization. J Bone & Joint Surg. 1938 20 178

Fractures of the metacarpals have always presented a vexing problem. Irrespective of the fracture site, the deformity is always dorsal angulation. Since the metacarpals are superficial, the cosmetic result is rather unpleasant. There is a 'bump' on the dorsum of the hand and what is even more important there is a disturbance in the alignment of the knuckles both in the frontal and sagittal planes. The head of each metacarpal is quite prominent in the palm of the hand due to the angulation of the distal fragment. The small distal fragment dips sharply downward into the palm and because of its shortness and its close proximity to the metacarpophalangeal joint control of the fragment becomes very difficult (Fig 1).

In metacarpal fractures excluding those in the proximal half of the shaft there is no direct purchase on the small distal fragment which makes it neces-



Fig 2. Complete correction of the dorsal angulation of fourth and fifth metacarpal fractures

sary for the surgeon to attempt reduction through the agency of the finger. However between the proximal phalanx and the fracture site is the metacarpophalangeal joint, which has motion in all directions. This motion must be nullified before direct control of the fragment can be obtained. Extension of the finger does not produce this effect and, to make things worse it increases the dorsal angulation. As is well known extension makes the interosseous muscles taut and since these muscles maintain the angulation, this pull on them will cause greater buckling of the fragments.

When the finger is flexed at the metacarpophalangeal joint to an angle of 90 degrees the head of the metacarpal is so firmly fixed to the base of the proximal phalanx by the collateral ligaments that any motion of that phalanx causes the head of the metacarpal to move along with it. In this position pushing upward or dorsally on the flexed finger effects extension of the distal fragment which corrects the dorsal angulation even though the fragments are not handled directly.

In the index and middle fingers this is easily accomplished but in the ring and little fingers a slight

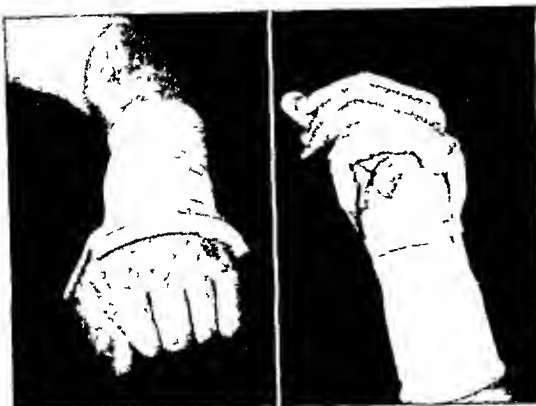


Fig 2a Note position of the heavy felt behind the knuckles and just distal to a fracture of the neck of the fifth metacarpal. It is held in position by one layer of tailor's felt, which extends about 4 in. above the wrist. Fig 2b First section of the plaster-of-Paris dressing applied. The second piece of heavy felt has been placed over the flexed finger and strapped to the plaster dressing. The metacarpophalangeal and proximal interphalangeal joints are in 90 degrees of flexion. The distal interphalangeal joint is in full extension.

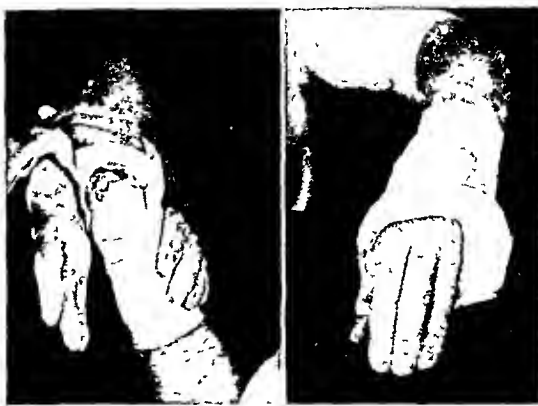


Fig 3a Note how extension of the distal fragment is obtained through the flexed finger. The palm of the hand is pressing upward on the plaster re-enforcement covering the finger from its tip to the flexed proximal interphalangeal joint. Note also that the surgeon's other hand steadies the initial plaster while the upward pressure is taking place. The position of the two hands remains the same until the re-enforcement is incorporated in the initial plaster and the entire plaster dressing is set. Fig 3b Plaster-of-Paris dressing completed. Dorsal view.

difficulty is encountered, a little more in the fifth than in the fourth finger. It is necessary to push these fingers farther dorsally than the others. Upon investigation the reason for this is found to be elementary. In the carpometacarpal joint of the little finger there is extension of about 15 degrees. In the corresponding joints of the index and middle fingers there is no dorsal motion whatsoever.

Before reduction can be effected reduction of either overriding or lateral displacement must first be done. Traction, countertraction, and manipulation, with the entire finger in flexion, usually produce the desired effect.

Also, should the fracture be impacted, it is absolutely imperative that it be broken up. The distal fragment must be freely movable before either correction of the angulation or immobilization is attempted.

In the first stage of reduction and immobilization, a strip of heavy piano felt, 1 in. wide and about 10 in. long, is split into two equal thicknesses. After one edge of one strip has been beveled off, the strip is laid across the dorsum of the hand, just proximal to the fracture line, with the unheveled edge facing the fracture. Since all the counterpressure will take place at this point, it is necessary to pad this part more heavily. The redundant portion of the felt is cut away. One layer of thin, white, tailor's felt is then applied to the hand, from the unheveled edge of the heavy felt to about 3 or 4 in. above the wrist (Fig 2a). A plaster-of-Paris dressing is next applied to this part of the hand, supplemented with a narrow re-enforcement placed transversely across the dorsum of the hand and overlying the heavy felt

(Fig 2b). This re-enforcement assures the maintenance of the counterpressure. The initial plaster dressing fixes the proximal fragment, and eliminates the factor of motion at the carpometacarpal joint.

The finger of the involved metacarpal is now flexed at the metacarpophalangeal and proximal interphalangeal joints to an angle of 90 degrees. The distal interphalangeal joint is permitted to remain in extension. With the finger in this position, the second piece of heavy felt is placed over it, from the unheveled edge of the heavy felt on the dorsum of the hand to a point just beyond the finger tip. A long adhesive strip holds it in place.

In the second stage one end of a slow-setting plaster-of-Paris re-enforcement $\frac{1}{4}$ in. thick, 1 in. wide, and about 14 in. long, is placed on the palmar aspect of the first plaster, 4 in. proximal to its distal edge, along the extended distal interphalangeal joint to the flexed proximal interphalangeal joint. With the palm of the hand, gentle upward or dorsal pressure is exerted on the re-enforcement covering this part of the finger, from its tip to the flexed proximal interphalangeal joint, with most of the force at the flexed proximal interphalangeal joint, until the dorsal angulation is overcome (Fig 3a). Once this is accomplished, the pressure remains constant to maintain the correction. An assistant then quickly brings the remainder of the re-enforcement over the proximal phalanx and the knuckle, and, finally, onto the dorsal aspect of the first plaster for a distance of about 3 or 4 inches. The re-enforcement is then immediately incorporated in the first plaster with one plaster bandage by including only those parts which overlap the first plaster (Figs 3h, 4a, and 4h). The



Fig 43. Lateral view. The finger can be inspected quite easily. The wrist is fixed in about 5 degrees of extension. Fig 44. Finished plaster dressing. Note freedom of the thumb and the other fingers.

dorsal or upward pressure is not released until the entire plaster is thoroughly set.

There is always some fixed flexion present at the metacarpophalangeal and proximal interphalangeal joints when the plaster is removed. It is much more pronounced in the latter joint. This is due to periarthritic adhesions which must be thoroughly broken up. It is the author's practice to do this at the time when the plaster is removed.

Fracture of any 2 of the 4 inner metacarpals can be reduced by upward or dorsal pressure on the flexed distal fragment with the metacarpophalangeal and proximal interphalangeal joints of the involved finger held at 90 degrees of flexion. This position at the metacarpophalangeal joint relaxes the interosseous muscles and at the same time tenses the collateral ligaments in this way permitting extension or correction of the angulation of the distal fragment through upward or dorsal pressure on the flexed proximal interphalangeal joint. This correction can be best maintained if the plaster of Paris dressing is applied in two sections, the first to immobilize the proximal fragment and the second to maintain the correction. NORMAN C. BULLOCK, M.D.

Dunlop J. Fractures of the Spine. *Am J Surg* 1937 39 569

The author discusses in considerable detail the etiology, diagnosis and treatment of fractures of the spine. He believes that a careful history of injury is of great importance. An extensive knowledge of adequate first aid is essential to reduce secondary trauma. Fractures associated with cord lesions present a special problem. When the paralysis is immediate and complete indicating complete cord severance a laminectomy is not indicated. If the paralysis is gradual and progressive reduction of the displacement by manipulation should be done. Fractures of the cervical vertebrae should be reduced un-

der local anesthesia by means of traction exerted by a Chisson sling. Following reduction a body cast either to the occiput and chin or in high fractures to include the head should be applied. In fractures of the thoracic and lumbar spine the author believes that reduction as soon as possible by hyperextension under general anesthesia should be done. Hyperextension can be accomplished either by a direct lifting of the body by the operator or by the use of a sling and block and tackle. After sufficient hyperextension has been obtained the patient is placed on a Goldthwait frame and a body cast is applied. A window should be cut in the jacket over the coccygium. The patient should be kept in bed until such time as bony union is complete, from fourteen to sixteen weeks at which time a roentgen ray check up is made. Fractures with lateral displacement can also be corrected on the Goldthwait frame. Every case with paralysis should have the advantage of reduction.

Numerous illustrations accompany the article.
RICHARD B. STIMSON, M.D.

Plummer W. W. Comments on Internal Fixation in Fresh Fractures of the Neck of the Femur. *J Bone & Joint Surg* 1938 20 97

Between September 1935 and May 1 1937 there have been referred to Plummer's Service in the Buffalo General Hospital a total of 37 consecutive cases of fresh fracture of the femoral neck. Two of the patients died almost as soon as they were admitted to the Hospital. All of the remaining 35 patients were operated upon and some form of internal fixation was employed. Thirty three cases would properly be classed as intracapsular fractures while 2 were fractures at the base near the trochanter. The ages of the patients ranged from forty six to ninety two years. Nine of the 35 patients in this series have died within the ten day postoperative period. The other 7 survived for periods varying from one month to eighteen months and died of cancer, uncontrollable diabetes and other causes due to senility.

The immediate postoperative results in this series furnish sufficient justification for the internal fixation operation. The patient is comfortably and easily cared for in bed, he has no pain and he is completely relieved of the apprehensions of a long and exhausting bedridden period in plaster or traction.

Twenty six of the patients are living. Four have been operated upon too recently to be commented upon at this time. The remaining 22 are comfortably ambulatory, their functional ability apparently depending on their age and general condition rather than on what might be termed their actual hip function which seems to be good.

With the exception of one hip with a fracture near the trochanter none of these hips up to this time have shown any tendency to relapse into the external rotation or varus deformity which is present in all cases of fracture of the hip. The follow up roentgenographic examinations in all these cases demon-

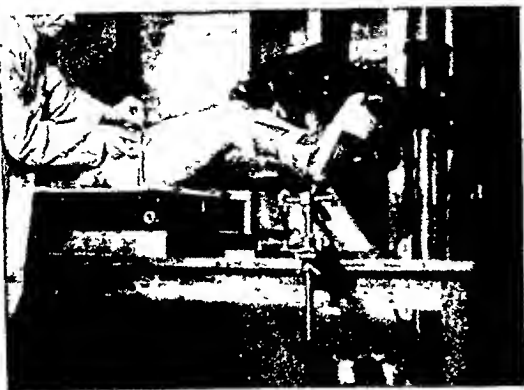


Fig 1 Table device which makes possible the determination of the exact point of entrance of the nail, of its length, and of the angle of incidence to the shaft

strated a varying degree of neck shortening, but there was no evidence of change from the stable weight-bearing relationship of the fragments at the time of reduction. All of the patients have shown a remarkable recovery of balance and muscle tone, in fact, none of them has suffered any of the usual muscle atrophy and loss of knee function associated with the use of plaster or traction fixation.

From the start, Plummer elected to reduce these fractures and to fix the fragments without opening the hip joint. All of the patients were operated upon by way of the lateral thigh incision, which exposes the trochanter and adjacent shaft.

The Whitman-Leadbetter procedure of reduction was followed, the injured leg was fixed in full internal rotation, with such flexion and abduction as seemed wise. When anteroposterior and lateral roentgenograms showed the reduction to be satisfactory, the position of the leg was not shifted until the operation was completed. This was accomplished by a special table which was readily adjustable to any desired leg position by means of mechanical devices, and which maintained a continuously fixed relationship between the femur and the x-ray apparatus. This complete and continuous mechanical holding of the injured leg, plus an x-ray technique which produces uniform roentgenograms of the hip joint from accurately standardized distances and angles, constitutes the most important part of the operation.

In the first 4 cases Kirschner wires were used. In the next 18 cases the Moore multiple pins were employed. In all the remaining cases the Smith-Petersen three-flanged nail was used, which the author believes meets all the requirements for this type of fixation instrument.

Following closely the procedures of Smith-Petersen, Johansson, and Wescott, the author, at the time of publication of this article, operated on 43 fresh fractures of the neck of the femur in 42 patients. In no instance had the hip joint been opened, internal



Fig 2 Modification of Wescott's protractor by which, on the postreduction film, the angle for the proper nail location is read and the total length of cortex, neck, and head is determined

fixation after reduction having been attained by means of the usual lateral thigh incision. The determination of the exact point of entrance of the nail, of its length, and of the angle of incidence to the shaft is made possible by the table device shown in Figure 1. With the patient already in position on the flat Bucky diaphragm, the fracture is reduced and the leg holder is adjusted to the leg in any position which seems proper. The usual leg position is the one shown in the illustration, namely, moderate flexion and abduction and full internal rotation. In this way the injured leg remains constantly and rigidly fixed in relation to the top and edge of the Bucky diaphragm, so that anteroposterior and lateral roentgenograms of the neck of the femur will be exactly duplicated throughout the entire operation. In making the anteroposterior roentgenograms, the x-ray tube is always centered over the hip at exactly the same distance from the top of the Bucky diaphragm.

The lateral roentgenogram is made by aiming the tube at the femoral neck along an imaginary line, called the pelvic line, from the lower edge of the symphysis pubis to the superior iliac spine, with the central beam of the tube inclined exactly 35 degrees below the horizontal. The cassette in its sterile cover rests on the top of the Bucky diaphragm with the edge pressed into the patient's flank and its surface at right angles to the pelvic line and inclined out against a light metal support, exactly 35 degrees from the vertical. At this time also a measurement is taken from the top of the table to the center of the mass of the femoral shaft as outlined by the thumb and forefinger (Fig 1). By means of this measurement, the exact distance of the hip from the x-ray can be computed for any given patient. It is called



Fig 3 Guide wire in place

hip height' and varies widely in different patients. It is important if we are to compute accurately from the roentgenographic findings the actual distance from cortex to head in any given patient.

Assuming that the position is satisfactory, the postreduction films are now ready for use. By using a modification of Wescott's protractor with its base on the edge of the film (Fig 2) certain data are obtainable. The angle for the proper nail location is read. The total length of cortex, neck, and head along this line is determined and noted. The distance down the shaft from the ridge is measured with a divider. While these angles and distances are being noted, similar sterile instruments *a* being set and adjusted by the operating room nurse.

To save time in calculating the actual neck length in the patient, which is a matter of arithmetical proportion, Plummer prepared a graph based on a constant height from tube center to film used in all cases. The left hand column represents the height of the hip from the film. The right hand column shows the length of the neck as measured on the roentgenogram. For example, if a straight edge is placed on 8 in. in the left hand column and on the roentgenographic measurement 6.3 in. in the right hand column, it will cross the center line just above 4, which will be the exact length in inches from shaft to head and a nail 3 1/4 in. in length is indicated.

With the lateral aspect of the shaft exposed, the point of entrance of the nail is spotted with a small



Fig 4 Nail driven into neck

drill and the dividers. With a protractor constructed to transfer the angle read from the roentgenogram to the operating table in a generally horizontal plane, a long, fairly stiff guide wire is drilled into the shaft, neck and head. An adjustable stop is located on the wire at the predetermined nail length from its entering tip.

The nail is easily and accurately driven parallel to the guide wire. Figures 3 and 4 show the guide wire in place and the nail driven. A lateral roentgenogram is then taken to check the position of the nail. Finally, after the wound has been closed and dressed, the thigh is flexed at a right angle.

The whole procedure takes from fifty to seventy minutes from the time the patient is placed on the table. This includes reduction, the taking of the three sets of two films each to check reduction, the insertion of the guide wire and nail, and of course the actual operating time which is really quite brief.

Plummer concluded:

1. Internal fixation of fresh fractures of the femoral neck has been demonstrated to be a justifiable and reliable method of treatment for this important and serious injury.

2. Internal fixation of these fractures can be accurately and successfully accomplished without the added hazards of the hip.

3. This procedure should not be classified as a simple and casual operation to be done under any and all conditions. However, judged on the merits of reported results from many clinics, this plan of treating fractures of the hip is worth all it costs in the

way of expensive and special equipment and deserves the thoughtful consideration of all surgeons charged with the care of these cases.

NORMAN C BULLOCK, M.D

Harris, R. I.: Experiences with Internal Fixation in Fresh Fractures of the Neck of the Femur. *J Bone & Joint Surg*, 1938, 20, 114

The author reviews a series of 50 cases of fracture of the neck of the femur which were treated by internal fixation with the Smith-Petersen nail. He believes that after a satisfactory reduction of the fracture, a properly placed nail will ensure union in practically every case, and has adopted the attitude that all fractures of the neck of the femur can best be treated by internal fixation. He emphasizes the importance of maintaining the fragments in close contact with each other during the entire period of healing.

The article is concerned chiefly with the difficulties and imperfections in the treatment which may cause unsatisfactory results. The importance of adequate roentgenographic control is stressed. The author then points out the dangers of too early weight-bearing, and advocates that the patients be kept in bed for eight weeks after operation. The danger of corrosion of the nail is prevented by using a highly polished nail of high-nickel, high-chromium steel. Occasional difficulty was encountered by inserting the nail completely through the femoral head either because the nail was too long or was driven in too far.

It is pointed out that the various methods now employed for introducing the nail are highly technical, and that simplified methods must be developed before this type of treatment can be applied more widely. Until this is accomplished, the simpler and more widely applicable abduction treatment of Whitman should not be abandoned.

DANIEL H LEVINTHAL, M.D

Inclán, A: The Treatment of Delayed Union in Fractures Involving the Neck of the Femur (Nuestra actitud frente a los trastornos de consolidación en las fracturas del cuello del fémur) *Ciruj ortop y traumatol*, 1937, 5, 234

The author states that in a high percentage of cases, fractures of the neck of the femur are followed by pseudarthroses. These arise not only as the result of faulty treatment, but their appearance depends also largely upon the site of the fracture, the age of the patient, and upon inadequate treatment.

Intertrochanteric fractures usually unite easily whereas union occurs with increasing difficulty as the fracture approaches the femoral head. Union occurs with greatest difficulty in subcapital fractures.

Other general factors which govern union are (1) the age of the patient, (2) the general condition of the patient, (3) the age of the fracture, and (4) the type of original treatment. All these factors should be taken into consideration in determining the surgical method to be employed in a given case.

The author has elaborated a questionnaire to be filled out by Cuban physicians asking them to report the type of treatment employed in intra-articular fractures of the femur, the favorable results obtained with this treatment (bony union confirmed with roentgen-rays), and the number of patients seen in follow-up examinations.

Concerning the treatment of delayed union in these types of fracture, the author emphasizes three basic requirements, i.e., the best possible alignment of the fragments, the maintenance of the reduction by means of an absolute immobilization of the fracture area, and stimulation of function.

The author discusses the various surgical methods employed by various authors and states that in cases with a potential pseudarthrosis, an osteosynthesis by means of bone grafts, as described by Delbet and Albee, should be attempted. Old pseudarthroses with marked resorption of the neck of the femur should be treated surgically by Whitman's reconstruction or, preferably, by the Smith-Petersen procedure which is less risky, more physiological, and more economical.

The author presents 4 patients, 2 of whom were treated for delayed union with a late osteosynthesis as advocated by Smith and Petersen. Inclán used a guide of his own invention. These patients were operated on from four to eleven months, respectively, following the injury. A good union was obtained in both cases.

Two other cases with complete pseudarthrosis were treated as follows: in the first case a trans-cervical autogenous bone graft was employed (Albee), whereas in the other, which presented a fracture of more than one year's duration, Whitman's reconstruction was performed.

In comparing the results obtained in both groups, the author concludes that patients treated by osteosynthesis could be discharged from the hospital as early as ninety days following the injury. A good function was obtained in 80 per cent of the cases.

RICHARD E. SOMMA, M.D

Eastwood, W. J.: Fracture of the Os Calcis. *Brit J Surg*, 1938, 25, 636

Due to the unanimous verdict given in regard to the prevalence of unsatisfactory end-results in fractures of the os calcis, numerous suggestions have been advanced in an effort to explain the divergent results in apparently similar fractures.

A careful study of roentgenographs and early operative interference has shown that in fracture of the body of the os calcis involvement of the subastragoloid joint to some extent is almost inevitable. The author believes that the most common cause for the disability which may follow a fracture of the os calcis is arthritis of the subastragoloid joint.

Rarely does a spur cause symptoms, and, when present and troublesome, relief will follow its removal. When mobile flat-foot is the cause of disability it can be relieved by correcting the weight-bearing line of the foot. The mass of the bone

frequently seen under the external malleolus in the early postaccident roentgenographs almost invariably shows complete or partial absorption in later roentgenograms. Patients in this group who complained of discomfort in the foot had more pain upon inversion than eversion. The foot which is rigid from adhesions or so-called fibrosis of the joints and tendons can usually be relieved by manipulation, massage and heat. The so-called osteitis or alteration in the affected bone which causes pain on weight bearing should also cause discomfort on lateral compression of the bone without movement of the joints. In none of the cases reviewed by the author was this sign elicited.

That restoration of anatomical alignment as stressed by Boehler will of necessity yield a perfect result is questioned partly by the evidence that intra articular fractures in other joints in individuals over forty years, are subsequently followed by a post traumatic arthritis although the roentgenograms show an apparently perfect anatomical alignment. It is doubtful if anything like 100 per cent recovery will follow the adoption of this method in which there are possibilities of failure or even disaster in inexperienced hands.

Plaster fixation with the foot in a neutral position and the arches molded into approximately their normal alignment, with no attempt to correct the deformity is the second method of treatment discussed. The results compare favorably with any other method of treatment although they cannot be described as consistently successful.

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In the study of 47 cases comprising 53 separate fractures of the os calcis the author has shown the lack of importance of the salient angle the preservation of which forms so important a part of the modern method of treating this fracture. In all the

cases of the series presented the angle was diminished or absent and there was a high percentage of good results.

A popular belief that elevation of the os calcis which may follow a fracture of this bone results in inability of the patient to walk on the forefoot by virtue of the calf muscles acting at a disadvantage is regarded as false. The inability to walk on the forefoot is caused by inversion of the os calcis at the subastragaloid joint which occurs when the patient rises on the toes. The inability to perform this exercise occurred only in those patients who had discomfort on sudden inversion of the foot and in the author's opinion was the result of pain and not of weakness of the calf muscles. The ability to walk on the toes was improved by manipulation of the foot. Manipulation was done in 29 patients. The best results were obtained in those cases with a comminuted fracture of the os calcis without displacement of the mid tarsal joint. The cases in which it was most difficult to relieve the pain entirely were those which presented a fracture of the neck of the os calcis with displacement upward of the anterior fragment.

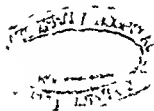
The ideal treatment is application of a plaster cast with the foot in a neutral position the arches well molded and no attempt to correct the deformity. Weight bearing is prohibited preferably for three months and then followed by active and gradually increasing massage and assisted movements. A manipulation under general anesthesia at the end of an additional two or three months time will hasten a return to work in those cases in which progress appears to be slow.

Forty seven patients were treated by simple immobilization without any attempt at reduction of the deformity. In this series 80 per cent returned to their pre accident work and although the majority did not complain of any discomfort several of them admitted that the injured foot was painful after a hard day's work or in wet weather.

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Sixteen roentgenographs are presented

R. P. MONTGOMERY M.D.



SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Fontaine, R : Arteriography of the Extremities
(L'artériographie des membres) *J internal de chir*, 1937, 11 559

The author reviews the technique of arteriography. He has adopted the methods of Dos Santos and finds them satisfactory.

With regard to complications following arteriography, the author believes that the use of organic compounds of iodine is dangerous. These compounds cause an intense vasoconstriction that tends to give rise to gangrene. On the other hand, thorotrast has always proved to be free from risk in his experience with over 300 arteriographies in five years. Thorotrast has been suspected of being dangerous because it is not eliminated by the body. The author has never seen a patient show signs of toxic reaction after the use of thorium dioxide.

In vasomotor syndromes, such as Raynaud's disease, arteriography is useful in confirming the anatomical integrity of the arterial system and complete absence of any organic lesion.

The author gives several examples of traumatic obliteration and aneurysm. He states that in Volkmann's contracture following a supracondylar fracture of the humerus, lesions of the artery, such as actual rupture or simple narrowing of the lumen, are always found.

In frostbite there is no apparent lesion of the larger arteries or immediate branches.

The diagnosis of arterial embolism is difficult. In undoubted emboli the arteriograph will show a healthy artery with a sharp arrest of the circulation at the level of the embolus.

Thrombo-angitis obliterans shows thin evenly contracted arteries in the pre-obliterative stage. The obliterations are sometimes multiple and fairly extensive.

Syphilitic arteries resemble those observed in thrombo-angitis obliterans.

Arteriosclerotic arteries are characterized before obliteration by being large, irregular, and winding with many narrowed places. Obliterations occur at various sites and are differentiated from thrombo-angitis obliterans because the former are more limited and the collateral circulation is usually richer.

The author divides diabetic gangrene into true diabetic gangrene, in which the obliterations are of the sclerotic type, and the phlegmonous type of gangrene, in which the arteries are permeable and show changes as in pre-obliterative stages of arteriosclerosis.

In venous affections arteriography plus venography gives valuable information.

The author gives also a physiopathological study of the collateral circulation in arterial obstructions.

The re-establishment of the circulation occurs by means of an intramuscular network of vessels which the blood reaches by way of the last arterial branches above the obliteration. The blood then follows in the reverse direction along similar terminal branches below and reaches the normal vessel again. If the obliteration is limited the collateral network develops no more than is necessary to return the blood to the main vessel again. The re-establishment of circulation depends on (1) the site of obliteration, (2) its extent, (3) the ease with which the collateral vessels can work, and (4) the patency of the main trunk below the obliteration.

HARVEY S. ALLEN, M.D.

Jennings, G. H : Arteritis of the Temporal Vessels.
Lancet, 1938, 234 424

In this report the author reviews the literature on arteritis of the temporal vessels and describes 2 additional acute cases.

In the 2 cases of temporal arteritis observed by the author there was a prolonged, febrile, debilitating illness of unknown cause. Severe headache was a feature of the illness in both cases. The temporal arteries stood out as tender pink cords and there were nodules on them and on the neighboring scalp. Pulsation gradually disappeared from the distal parts of the affected arteries subsequent to the appearance of the inflammation. In 1 case thrombosis also occurred in both retinal arteries, and caused great and persistent visual impairment. There was present also much narrowing of the arteries of the right foot and of the left brachial artery. The condition cleared up in both cases. In addition to these symptoms, there were general malaise, lassitude, weakness, night sweats, anorexia, loss of weight, anemia, and mild leucocytosis. Pain in the jaw on opening the mouth, and earache are other possible symptoms. The usual duration is from two to six months and the course is toward recovery. The condition is almost invariably found in persons over sixty years of age.

Apart from general measures, treatment must obviously be empirical in these cases. Potassium iodide and sodium salicylate were used, and iron was given to relieve the anemia.

The author makes a brief comparison of the abnormal and pathological features of polyarteritis nodosa, thrombo-angitis obliterans, rheumatic arteritis, and temporal arteritis. A distinction between temporal arteritis and polyarteritis nodosa is not possible on clinical, and is difficult on pathological, grounds. In general, polyarteritis nodosa shows acute widespread and fatal lesions in vital organs, while thrombo-angitis obliterans and temporal arteritis are comparatively chronic and localized. However, thrombo-angitis may be widespread and rapidly fatal, with involvement of both visceral and

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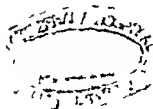
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this question, the authors examined the patient to determine the reaction of the vessels to various stimuli. Their capacity to dilate was noted in the response to heating the whole body, and in the response to heating the trunk or two extremities alone. There were lower skin temperatures and a slightly delayed response in the patient with acrocyanosis as compared to those of a normal control. Ultimately, complete relaxation of the skin vessels occurred in both. The reactive hyperemia was estimated and an experiment with nerve block was carried out on the patient. The responses to acetylcholine, histamine, and mechanical stimuli were studied. By the use of adrenalin and pituitrin, it was shown that the vessels are capable of responding to both of these reagents by contracting, hence, the disease does not involve a structural change in the capillaries.

From these studies the balance of evidence points to the conclusion that the essential vascular change consists in the functional spasm of the terminals of the arterioles. At the same time the capillaries and the minute vessels of the subpapillary venous plexus are dilated. The question regarding the underlying cause of these changes and whether they are to be ascribed to local, remote, or general factors is studied in great detail.

Whatever may be the origin of the disturbance in acrocyanosis, the tissues, the vessels, the central nervous system, or the endocrine glands, the question still remains as to what is the ultimate nature and cause of these changes. The authors state that it would not appear justifiable at present to regard acrocyanosis as a specific disease. The early age at which the disease appeared, the absence of anything pointing to trauma or infection at any period of the patient's life, the family history, and the presence of a mental defect all point to the conclusion that the condition is developmental in origin and possibly inherited. Although several members of the family on the father's side had chilblains and blueness and coldness of the extremities, one cannot be certain that the vascular disorders from which they suffered were of a character similar to those of the patient. The history is, however, sufficiently striking to suggest that some of the milder forms of acrocyanosis and forms appearing later in life may be incompletely developed examples of the same inherited anomaly. Such examples give very little clue to the fundamental character of the disorder, but when acrocyanosis shows itself as merely one feature in a syndrome which includes mental defect and disorders of growth and metabolism dating from infancy, the balance of evidence seems to point to its being due to some error of development involving the cerebral mechanisms responsible for the control of the vascular tone and other vegetative functions.

The authors note certain points in the diagnosis of acrocyanosis which lead to a differentiation from Raynaud's phenomenon and from cyanosis or erythema affecting the extremities in early life. Acrocyanosis differs from Raynaud's phenomenon

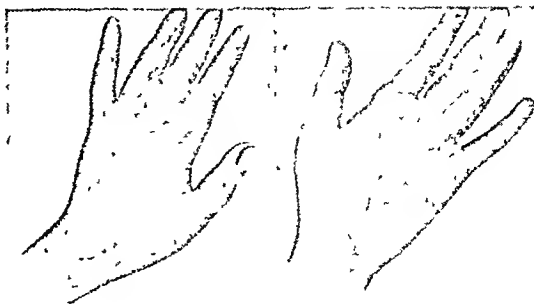


Fig 1 Showing distribution of area of vasodilatation after ulnar nerve block

in that it is symmetrical, diffuse, and permanent, i.e., non-paroxysmal, and it may affect the face. There is an absence of blanching, trophic changes, and pain. It affects a more distal segment of the vascular system and the abnormal reactions of the vessels are abolished by nerve block. Acrocyanosis differs from congenital heart disease in early childhood in that there is no arterial anoxemia in the former.

HERBERT F. THURSTON, M.D.

Verovitz, C. H.: The Result of Ten Years' Experience with Various Solutions Used in the Injection Treatment of Varicose Veins and Ulcers of the Legs. *Ohio State M. J.*, 1938, 34: 37.

The author defines varicose veins and establishes their chief location anatomically. In the etiology, he notes that the saphenous system has been put to an unusual strain through man's assumption of the erect posture. The anatomical course of the saphenous veins deprives them of the milking effect of muscular activity of the legs. Moreover, these veins are unsupported by muscle tissue. By questioning all patients the author found that in 75 per cent of the cases, one or both of their parents were afflicted with varicose veins. Many patients with varicose veins also present other evidences of connective-tissue weaknesses of the venous and ligamentary structures, such as hemorrhoids, varicoceles, and flat feet.

A number of definite physical factors which directly account for the mechanical disabilities involved are enumerated and discussed. Among these are an increase in intra-abdominal pressure, and an increased venous pressure such as that which exists in certain diseases of the heart, lungs, and liver. Direct pressure by a neoplasm or a gravid uterus on the large venous trunks in the pelvis, and prolonged standing or walking are some of the common physical factors.

The morbid anatomy of varicose veins and the clinical features and symptomatology are presented in detail. Varicosities are most frequently found between the ages of twenty and forty, predominating in the female sex. The subjective symptoms are variable. The amount of discomfort bears no direct



Fig 1. Longitudinal section of wall of temporal artery (X100). Shows thickened cellular and fibrotic intima (A) with ruptured internal elastic lamina (dark stain) disorganization and fibrosis of media with leucocyte and giant cell invasion (B) and fibrosis of adventitia (C)

retinal vessels. Because of the changes found in the arteries of the limbs and also because of the appearance of red blood cells and hyaline and granular casts in the urine it is suggested that temporal arteritis may involve other arteries than the temporal. The severe headaches that are a constant feature of all the cases of temporal arteritis are thought by some to indicate inflammation of the cerebral arteries.

The author concludes that in the present state of knowledge it is difficult to be sure that there may not be some similar cause of inflammation of the groups of arteritis mentioned. It may be that age in some way modifies the inflammation of polyarteritis nodosa, and that it is this modification which is found in temporal arteritis.

HERBERT F. THURSTON, M.D.

Lambie C. G. and Morson S. M. Acrocyanosis. *Med J Australia* 1937 2 1070

In an extensive introduction and historical review the authors state that although acrocyanosis may

be regarded as a trivial disorder of the peripheral circulation devoid of serious consequences and causing little if any, disability or discomfort nevertheless it is of considerable clinical and physiological interest. The study of pathological anatomy and experiments on animals has thrown little light on the condition. The two cardinal signs coldness and blueness of the extremities, are found very commonly and may arise from a variety of causes. It has been suggested that the condition is a disturbance of the nervous or neuro endocrine control of the vessels. Other students of the condition consider that the fault is localized in the vessels themselves.

As acrocyanosis in its fully developed form is rare the author reports in detail the single case that they have observed. The interest in this reported case lies in the association of the typical and fully developed condition with disturbances of mental development bodily growth and metabolism.

The patient was a single woman twenty one years old who complained of coldness and blueness of the extremities and of highly colored cheeks present since early childhood. She had been excessively thin since childhood. Menstruation had never appeared. The blueness of the extremities had been constant but varied in intensity with the temperature being more marked in cold weather. There were no paroxysms the fingers never became blanched and the patient never suffered pain cramping stiffness numbness or other forms of paresthesia. Aside from the aforementioned complaint the patient never had had any illness of any kind. There was nothing in the family history to suggest syphilitic infection or birth injuries. A brother a sister her father three uncles and an aunt on the father's side all complained of chilblains and blueness of the extremities. Examination of the nervous system revealed a subnormal intelligence which resulted in the patient's being unfit for any occupation. Her memory was poor and she exhibited retarded cerebration. Physical examination of the nervous system revealed no abnormality of sensation or movement or of reflex activity.

In their study of this case the authors recognize two distinct problems concerning the pathogenesis of acrocyanosis. First there is the question of localization and character of the vascular changes and second that of the underlying causes of these changes. As to the localization of the vessel changes the fault might be in any part of the peripheral vascular system in the veins capillaries, arteries, arterioles or arteriovenous anastomoses. Evidence pointing to each of these locations is presented along with the conclusions of the authors. Two changes were shown to be present namely arteriolar obstruction and capillary dilatation. Whatever may be the nature of the substances causing vasodilatation it is clear that narrowing of the arterioles can lead to chemical changes which result in capillary dilatation.

The question whether the vascular changes are structural or functional is then presented. To answer

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Fine, J., Hermanson, L., and Frehling, S : Further Clinical Experiences with 95 Per Cent Oxygen for the Absorption of Air from the Body Tissues *Ann Surg*, 1938, 107 1

When atmospheric air accumulates in excessive quantities in body cavities or tissue spaces, it may become a noxious foreign body causing symptoms which vary from a mild discomfort to alarming distress. This is the situation in gaseous distension of the intestine, spontaneous pneumothorax, subcutaneous emphysema, air embolism, and the immediate postencephalographic state. The oxygen fraction of the air is rapidly absorbed, but the nitrogen fraction remains as the offending agent. The simple expedient of withdrawing the incarcerated nitrogen by needle and syringe can be effectively applied only in the case of pneumothorax. The authors have attempted to effect the removal of the nitrogen indirectly by lowering the tension of the nitrogen in the blood stream. This is readily accomplished by supplanting the ordinary air which is breathed by 95 per cent oxygen.

The inhalation of 95 per cent oxygen provides an effective method for deflation of the distended intestine when other non-operative measures fail, whether the distention is of functional or mechanical origin. In mechanical ileus it may be used to advantage before or after enterostomy is performed.

It prevents or relieves the symptoms following encephalography.

It is of little or no value for the treatment of valvular pneumothorax or mediastinal emphysema as long as the size of the point of rupture is of any consequence.

None of the patients who breathed 95 per cent oxygen for the length of time necessary to obtain therapeutic effects showed any signs or symptoms of oxygen poisoning. Toxicity was avoided by interrupting the administration of the gas from every four to eight hours for one-half hour or longer.

The length of time necessary to obtain therapeutic benefit from the administration of 95 per cent oxygen cannot be predicted in any given case. It will vary in accordance with the volume of air to be absorbed and the relative extent of the surface area that is available for absorption. SAMUEL KAHN, M D

Haight, C. Intratracheal Suction in the Management of Postoperative Pulmonary Complications *Ann Surg*, 1938, 107 218

Stasis of secretions within the tracheobronchial tree is an important cause of postoperative pulmonary complications, notably atelectasis, aspiration "pneumonia," suppurative pneumonitis, and pulmonary abscess. The constant maintenance of

adequate intrabronchial drainage is essential for the prevention and treatment of such complications. When patients are willing to co-operate and when they are not so ill that they are unable to co-operate, free drainage can be maintained by postural methods, by hyperventilation with 15 per cent carbon-dioxide inhalations, by the administration of sufficient narcotics to control pain and promote effective coughing, and lastly by well directed nursing so that they will be assisted in coughing.

In other instances intratracheal suction, whether by bronchoscopic aspiration or by intratracheal catheterization, must be employed, occasionally as an emergency measure when patients are literally drowning in their own secretions. Intratracheal suction seems indicated when, despite the prophylactic measures mentioned, the cough remains wet and unproductive. In an unconscious patient the presence of rhonchi, wheezes, or a wet type of breathing and cyanosis is considered suggestive of retained secretions. Of the two methods of intratracheal suction, bronchoscopy is preferred by the writer when a single aspiration only is necessary and in definite cases of atelectasis. When repeated aspirations are necessary or when bronchoscopy seems too formidable a procedure, a soft rubber Robinson type of French catheter No. 16 is introduced through the external nares, and when the patient coughs because of irritation of the larynx the catheter is inserted into the trachea and aspiration is applied. This procedure is carried out with the patient in the Trendelenburg position. The patient is turned from side to side during aspiration in order that the primary bronchi may be reached. The aspiration is continued usually for one or two minutes or until no further purulent material can be obtained. As suction tends to provoke excessive coughing and slight cyanosis, it is usually necessary to apply the suction intermittently by repeatedly pinching the catheter for a period of several respiratory phases from time to time, so that the patient will not be too much upset by the procedure. The secretions tend to re-accumulate after a time and the aspiration may be repeated again in from four to six hours until the patient is able voluntarily to cough and expectorate effectively.

A case is reported in which, following secondary closure of an abdominal wound after gastric resection for carcinoma, a disruption of the wound occurred on the tenth postoperative day. Sudden marked cyanosis, dyspnea, coma, and loud râles, which developed twenty-four hours later, were not relieved by the use of an oxygen tent. Intratracheal suction applied as described resulted in the return to consciousness fifteen minutes later. Repeated suction was applied every two hours for the next day and every four hours for the next two days. X-ray examination revealed an extensive pneu-

proportion to the extent of the varicosity. The usual complaint is a sense of weight and fullness in the limb after standing or walking, sometimes accompanied by actual pain from which relief is at once obtained by raising the limb. Early symptoms of progressive venous insufficiency are a tired heavy sensation in the legs, cramping of the calves at night and sometimes slight swelling of the dorsum of the foot and ankle. In some instances the pressure and traction on the saphenous nerve which accompanies the saphenous vein produces pain along the course of the nerve. Pigmentation of the skin may occur as a result of stagnation beginning just above and on the medial aspect of the ankle.

The complications of varicose veins are ulcers, phlebitis, eczema, rupture of a vein, and superimposed skin infection which may easily spread over wide areas. Stagnation, edema, anoxemia, ulceration, and finally secondary infection is the usual sequence in the development of a varicose ulcer.

The object of an injection in the treatment of the varicose vein is to obtain a firm clot in a limited selected area. Contra indications for injection treatment consist of serious diseases of the heart, severe diabetes, enfeebled health in old persons, pregnancy in the third trimester and Buerger's and Raynaud's diseases. Hyperthyroidism, active tuberculosis, evidences of deep vein involvement and marked focal infections or acute infections are further contra indications.

The author presents his findings in a study to determine the nearest ideal sclerosing solution for the injection treatment of varicose veins. Such a solution must be of low toxicity, should produce perfect sclerosis, should not cause pain nor produce cramps and if extravasation occurs should not produce a slough.

Quinine urethan is a satisfactory agent except for slough formation if injected outside the vein. In some persons distressing symptoms from quinine idiosyncrasies occur. A small dosage is required and it is very toxic. This solution does not have the qualifications of an ideal solution. Neither is sodium salicylate an ideal solution as it is very toxic to some patients. When extravasation takes place, a

marked slough may follow and there is a greater tendency to recanalization and recurrence of the varicosities.

Sodium chloride solution in 20 per cent strength is non-toxic but causes marked cramping and necrosis may occur when it is given outside of the veins. Dextrose solution in 50 per cent strength has a high viscosity and is hard to inject. A combination of 30 per cent dextrose, 10 per cent sodium chloride and 1 per cent benzyl carbinol is known as varisol. This solution has a good sclerosing effect and if given carefully can be employed with a considerable degree of safety and with a satisfying result.

Sodium morrhuate is used in a 5 per cent solution combined with benzyl alcohol for its local anesthetic effect. The average single injection was 1 c.c. although up to 5 c.c. may be given. Multiple injections given by the author at one sitting have amounted to 20 c.c. without any after-effects. There may be a localized or a constitutional allergic reaction to sodium morrhuate, and for that reason one should be careful with the injection of this solution in individual who are subject to hay fever or any other allergic phenomena. In 25 per cent of the persons who were given injections, there were recurrences by recanalization, because the resultant clot was soft and friable. Sodium morrhuate is numbered as a good sclerosing agent but not the ideal solution for the injection treatment of varicose veins.

Fifteen hundred cases treated with moru quin are reported. This is a combination of 5 per cent sodium morrhuate, 2 per cent alkaloid quinine and 2 per cent benzyl alcohol. In a comparison with the sclerosing solutions already mentioned moru quin is superior in every respect. The margin between the therapeutic dose and the toxic dose is a wide one. As much as 24 c.c. of this solution has been given to one patient in multiple injections, with no toxic effects. The author has not seen severe local reaction or sloughing following accidental injection of moru quin outside the vein. In cases complicated by an ulcer or eczema, injections of moru quin should be given into the varix that is keeping this area engorged with venous blood.

HERBERT F. THURSTON, M.D.

ultraviolet light therapy and the second sulfanilamide medication. Twelve patients, because of the gravity of their condition, were transferred from the first group to the second and were given sulfanilamide.

In addition to the specific therapy, all of the patients, whether of Group I or II, received identical treatment and nursing care. On admission to the hospital every patient received a soap and water enema. The only laxative permitted was liquid paraffin. The diet for the first four days was liquid; by the end of the first week some solids were given, and thereafter the patients were put on an ordinary diet. During the first week eggs and onions were not included in the diet.

The patients in Group I received the ultraviolet light therapy from a portable mercury vapor lamp about 12 in. distant from the lesion. Female patients were exposed to the ultraviolet light for eight minutes and male patients for ten minutes, once daily.

Sulfanilamide was given to the patients of Group II immediately upon admission. It was given in doses of 1, 2, or 3 gm. every four hours until the temperature became normal and thereafter in doses of $\frac{3}{4}$ gm. three times daily until the patient left the hospital. On the average a patient required about 14.64 gm. of sulfanilamide in two and one-half days before the temperature became normal. The usual stay in the hospital was about fourteen and four-tenths days, and the average total dose of sulfanilamide given was 41.6 gm. The authors noted that some patients excreted the sulfanilamide tablets undissolved, they therefore used the drug in powder form.

The statistical study of these 270 cases of erysipelas is based on such fundamental factors as (1) spread of the lesion, (2) duration of the primary pyrexia, (3) duration of the toxemia, (4) recurrence, and (5) complications.

At the end of the first day of treatment with ultraviolet light the lesion ceased to spread in 59 per cent of the cases, while after the first day of treatment with sulfanilamide the lesion stopped spreading in 96.9 per cent of these cases. At the end of the second day the lesion continued to spread in 27.1 per cent of the first group and 77 per cent of the second. The primary pyrexia and return to normal temperature occurred in forty-eight hours in 47.3 per cent of the first group and in 75.2 per cent of the second. After three days the fever continued in 40 per cent of the first group and in only 9.6 per cent of the second. The number of patients with toxemia was greatest in Group I. After three days 43.3 per cent of the first group and 23.47 per cent of the second group were toxic. Recurrences followed in 8 of the first group but in only 2 of the second. Complications such as abscesses, septicemia, thrombosis, and nephritis were more than twice as frequent in the group treated by light therapy.

Toxic manifestations due to the drug itself occurred in 29.6 per cent of the second group. These

toxic signs and symptoms were cyanosis (35 cases), severe vomiting (2 cases), toxic eruptions (3 cases), and drug fever (3 cases). The authors did not consider any of these toxic effects as alarming.

The authors tried to saturate some of the patients by repeated doses of from 3 to 6 gm. of sulfanilamide. They did not find that the larger dose was superior to the smaller dose of 1 gm. They suggest, therefore, that patients with erysipelas, when seen by the physician, be given a cleansing enema and treated with 1 gm. of sulfanilamide every four hours until the temperature becomes normal. After this they are to receive a maintenance dose of $\frac{3}{4}$ gm. three times daily for a period of ten days.

The authors believe that sulfanilamide is unquestionably superior to any other type of therapy for erysipelas. BENJAMIN G. P. SHAFIROFF, M.D.

Keefer, C. S.: Hemolytic Streptococcal Infections, with Special Reference to Prognosis and Treatment with Sulfanilamide. *New England J. M.*, 1938, 218, 1.

The writer concludes that in hemolytic streptococcal infections the prognosis depends on the summation of such factors as the age of the patient, the location and extent of the local lesion, the presence of debilitating diseases, and the presence or absence of bacteremia. The fatality rate is highest in patients under five and over fifty years of age. Puerperal infections and cellulitis are usually more serious than throat infections. Such associated conditions as peripheral arteriosclerotic occlusion, diabetes, tuberculosis, portal cirrhosis, and chronic nephritis naturally increase the mortality rate. With bacteremia, the mortality rate is about 70 per cent, it is highest with cellulitis and erysipelas, slightly lower in puerperal sepsis, and lowest in infections starting in the throat, middle ear, and mastoid processes during the first two decades.

The type of treatment and the availability of the local lesion for surgical treatment are important. Antitoxin is most effective in young patients with scarlet fever. Immune blood transfusions are helpful in infections with bacteremia and no sign of a localizing process. Sulfanilamide is effective in delaying the death of mice infected with many lethal doses of hemolytic streptococci. In man, recovery from hemolytic streptococcal meningitis and from bacteremia after the use of this drug suggests a beneficial effect, but a longer experience is necessary to determine a more precise definition of its field of usefulness.

The results of the writer's experience with sulfanilamide in 9 cases of hemolytic streptococcal infection with bacteremia and in 8 cases of localized infection are reported. Six patients of the former group recovered and 3 died, 1 within twenty-four hours. All of the patients without bacteremia recovered. The advisability of limiting the amount of the drug in patients with renal insufficiency and of making repeated leucocyte counts to detect any signs of agranulocytosis is stressed.

WALTER H. NADLER, M.D.

monitis. From 10 to 30 c cm of purulent excretion were obtained at each aspiration. The cough became effective on the third postoperative day and intra tracheal suction was discontinued. Marked clearing of the pneumonitis was noted by x ray examination on the eighth day and the patient progressed to complete recovery.

Although it is not always possible to prevent the development of postoperative pulmonary complications it is believed that the incidence and severity of such complications can be greatly decreased by adherence to the preventive and therapeutic measures described. THOMAS C. DOUGLAS, M.D.

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Chinaglia A. The Treatment of Burns with Local Applications of Cod Liver Oil (*La cura delle ustioni con applicazione locale di olio di fegato di merluzzo*). *Chir. 193* 23 843

In 1939, Loehr began to use cod liver oil locally in the treatment of infected wounds and various suppurative processes and obtained excellent results. Later this investigator applied it also to burns, and in 1934 he published a review of 130 cases of burns of first, second, and third degrees so treated.

Loehr originally suggested the following technique: the oil is used in the form of an ointment made up of one part of cod liver oil and three parts vaseline. This ointment is applied about one finger thick over the entire burned area. The area is furthermore covered with light gauze and a light cast bandage is applied. The part is redressed every ten days.

Chinaglia began to use Loehr's method in 1935. At first he used sterilized cod liver oil but the results obtained were mediocre. After having learned that the common pyogens do not grow in the oil the author used the unsterilized product with excellent results.

The author treated altogether 35 cases of burns of first, second and third degrees. His method differs somewhat from that of Loehr's and may be outlined as follows:

When the patient enters the clinic the author treats the burn with gauze soaked in a 5 per cent solution of picric acid, and after twenty-four hours the vesicles are opened, the dead skin is removed and pieces of gauze soaked in pure unsterilized cod liver oil (without vaseline) are applied. A simple bandage is made and the part is kept immobilized by means of a splint if necessary. The bandage is left in place for from four to six days and is then renewed. It is imperative to excise all the vesicles otherwise healing is greatly delayed and secondary infection may supervene.

The author presents subsequently 16 typical cases of thermal as well as caustic burns which were treated in this fashion. Six of these were of the third degree and they healed without leaving a scar.

Based on this experience the author believes that the application of cod liver oil to burns offers the fol-

lowing advantages: (a) it is painless, (b) it produces a rapid epithelization with subsequent rapid healing of second degree burns within from eight to twelve days, (c) it prevents secondary infection by inhibiting bacterial growth, (d) in third-degree burns the necrotic parts are rapidly cast off and epithelization is so complete that grafting becomes unnecessary, and (e) the newly formed skin is delicate, no scars may be distinguished, no keloids develop and the cosmetic effects obtained are fully satisfactory.

RICHARD E. SOMMA, M.D.

Hoeferlein H. The Development of Chemotherapy for Bacterial Diseases. *Practitioner* 1937, 139 635

The author gives a brief historical review of the great advances in bacterial chemotherapy which have taken place since the discovery of the anti-streptococcal effectiveness of prontosil announced by Domagk in 1935. The original preparation of prontosil was made by Mietsch and Klarer, in 1932 by diazotization of sulfanilamide. Trefouel, Aitzi and Rovet in France then discovered that sulfanilamide alone without diazotization possessed all the chemotherapeutic properties of prontosil. The leading contributions of English and American workers to date have been the clinical studies of Colebrook and associates, and of Long and Bliss.

A great variety of modification of the chemical composition of sulfanilamide have been prepared and tested without the discovery of any modification superior in effectiveness to sulfanilamide. The contributions of Buttler *et al.* and of Trefouel *et al.* have been particularly significant in this field. The scope of usefulness of sulfanilamide has been extended to include gonococcal, meningococcal, pneumococcal and gas gangrene infections. The German investigators have prepared new compounds which it is hoped may have increased effectiveness in non-streptococcal infections. The essential mode of action of sulfanilamide has not yet been discovered though valuable study of the pharmacology of the drug has been made by numerous workers. Other interesting historical references to the early preparation of sulfonamides are appended. The author lists a bibliography of 80 titles which constitutes the chief value of this paper.

JOHN S. LOCKWOOD, M.D.

Snodgrass W. R. and Anderson T. Sulfanilamide in the Treatment of Erysipelas. *Brit. M. J.* 1937 2 1256

The authors have previously reported on their clinical studies of the treatment of erysipelas. They used sulfanilamide in one group of patients and ultraviolet light in the control group and found that sulfanilamide decreased the duration of the spread of the local lesion, the degree of pyrexia, and the amount of toxemia.

The present report is intended to reveal additional advantages of sulfanilamide therapy. Two hundred and seventy cases of erysipelas were divided equally into two groups, the first of which received

PHYSICO-CHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Wintz, H : Basic Principles for Successful Roentgen Therapy of Carcinoma. *Radiology*, 1938, 30 35

The author emphasizes the importance of roentgen treatment by a medical, rather than by a non-medical personnel, and the importance of the knowledge by that personnel of the exact physical characteristics of roentgen therapy

He believes that the assumption of an elective radiosensitivity has caused some of the most disastrous effects during the past twenty years. It has been proven that all of the cells in the body are affected, and that none are immune to destruction by roentgen rays. Effective cancer therapy is, therefore, based upon the fact that cancer cells are generally more radiosensitive than normal cells. Radiotherapy is a local measure, first and last, and the action of the rays on the general organism and its defense mechanism is of minor importance. The point of attack of the roentgen rays in the cell is the nucleus. Cells are most radiosensitive in the caryocinetic stage, and only cells in this stage have perished immediately after roentgen treatment. Other cells continue to live up to the moment of their caryocinesis. Cells which have been in a state of complete rest at the time of irradiation have suffered the least severe injury, they are able to undergo caryocinesis once or twice, but after that their regenerative function is extinct.

The "skin unit" is that quantity of rays which produces a marked reddening of the skin after from eight to ten days, and a faint tanning after from four to six weeks, which often lasts for years. The dose that is necessary for arrest of the menstrual cycle is the "sterilization dose," which amounts to 34 per cent of the "skin unit." The "cancer dose" is from 90 to 125 per cent of the "skin unit," the dose of 90 per cent representing the least permissible limit, which is not to be reduced if one expects to exert a curative action on a cancerous growth. For the past ten years, the author has employed at least 110 per cent of the "skin unit" in the treatment of any carcinoma, and 125 per cent in the treatment of adenocarcinoma. The highest permissible dose is one just sufficient to inflict lethal injury to quiescent cancer cells.

In treating cancer of the breast, the author uses a long focus skin distance, from 100 to 120 cm. In the treatment of carcinoma situated near the surface and surrounded by uneven body levels, it is difficult to secure homogenous irradiation. For this reason, the results of treatment in cancer of the anus are unsatisfactory, the results are much better in cases of cancer of the rectum. There is a similar striking difference between the results obtainable in cancer of the cervix uteri, and those in vaginal or vulvar cancer. In these cases, although the histo-

logical type of the cancer is the same, there is a pronounced difference in the number of five-year cures, which amount to 70 per cent in the cases of tumor limited to the cervix, and 25 per cent in the cases of cancer of the vulva.

In order to obtain, by fractionated doses, a reaction equivalent to that of the "skin unit" applied at one sitting, it is necessary to increase the total amount by the application of the so-called "additional biological dose." A similar diminution of the biological efficiency becomes manifest with increase of the target skin distance. The ratio of radiosensitivity is altered by fractionation, the cancer cells become less radiosensitive, and the connective tissue cells more radiosensitive. To avoid this, the author believes that it is necessary to deliver the irradiation at one sitting. He is of the opinion that speculation with regard to the Courtyard method is erroneous.

Relative radiosensitivity is altered by a coincident inflammation. The cancer cells become less radiosensitive, while the susceptibility of the surrounding healthy tissue is increased. In order to avoid failures in cases of infected cancer, it is necessary to reduce the inflammation before irradiation as far as this is possible.

The systemic treatment of the organism should not be neglected in radiotherapy of cancer, as such treatment greatly contributes to a permanent cure. It is necessary to control elimination before beginning irradiation. The intravenous injection of hypertonic solutions and, later, the intravenous injection of colloidal sulphur, are effective in eliminating roentgen sickness. Local treatment of the irradiated parts is necessary. Ointment should be applied to the skin, and instillations of oil should be given for relief of the reaction in the intestinal mucosa. The patient should be told that the irradiated parts of the skin, as well as of the underlying tissue, are more sensitive and less resistant to other noxa than normal tissues.

HAROLD C. OCHSNER, M.D.

Miller, T. G : Rectal Stenosis from Roentgen Therapy. Report of 2 Cases. *Ann. Int. Med.*, 1937, 11 993

The complication of rectal stenosis occurring after roentgen therapy apparently is well recognized by gynecologists, proctologists, and radiologists, but internists generally have not fully appreciated its frequency or clinical importance. The incidence of rectal complications following radiation therapy is discussed by Buie and Malmgren, who state that of 2,073 patients who had been subjected to pelvic irradiation for external lesions, 3.13 per cent were found to have rectal symptoms and a lesion demonstrable by the use of a proctoscope. The time of onset averaged eleven and six-tenths months after treatment, and the outward symptoms were bleed-

SURGICAL INSTRUMENTS AND APPARATUS

Thompson C J S The Evolution and Development of Surgical Instruments *Brit J Surg* 1938 25 479

The saw has been known to man from the neolithic period. Pliny ascribes its origin to Daedalus or his nephew Perdus, who was supposed to have conceived the idea from the jaw of a serpent with which he found he was able to cut a piece of wood.

Saws with blades of finely flaked flint with serrated edges have been discovered in the lake dwellings of Switzerland and also in Egypt dating from at least 2700 B.C. A specimen in the British Museum (Fig. 1) is said to be of the pre-dynastic period and shows the tool as used by the Egyptians over 4000 years ago. In ancient Greece saw blades of copper were used first, but were succeeded by bronze blades which were found to be more durable. In the Roman era a century or two before the Christian era blades of iron and steel appeared.

Allusions to the use of the saw for surgical purposes are made by several of the classical writers and among others by Celsus (25 B.C.—50 A.D.)

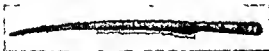


Fig. 1. Flint saw blades set in a wooden haft. Egyptian pre-dynastic (before 3300 B.C.) (Courtesy of British Museum)



Fig. 2. A guarded amputation saw for cutting the bone without injuring the soft parts (eighteenth century). B. La Faye's bow saw (c. 1740).

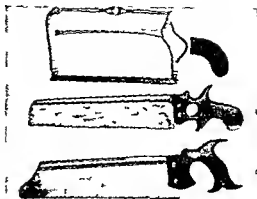


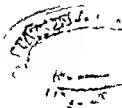
Fig. 3. A. Butcher's saw. B. Tenon saw used by an army surgeon on the field of Waterloo (nineteenth century). C. Tenon saw used by Fergusson and Lister (nineteenth century).

in his description of the amputation of a gangrenous limb. Paul of Aegina alludes to the surgical saw in the seventh century and the small saws used in cranial operations probably date from about this period. From that time on numerous saws of various design were developed.

During the eighteenth century many innovations were introduced. Among them was the guarded amputation saw which was designed to cut the bone without injury to the soft parts. It consisted of a flat metal bar enclosed in a sheath with a sawing edge 7 in. long. It had a bow-shaped clip which prevented complete closure of the two halves of the sheath so that the sawing edge was exposed constantly. In 1740 LaFaye introduced the bow type saw with a removable blade which could be tightened by a screw at the end of the frame and which may be regarded as a forerunner of saws of this type.

About the middle of the eighteenth century the bow saw gave place to the tenon blade and thus the name amputation saw became identified with an instrument having a straight back and a deep soled blade like the carpenter's tool which is commonly used to day.

ARTHUR S. W. TOLSON M.D.



sis was cured by malarial treatment although the temperature elevation was most moderate, also the long persistence of a positive Wassermann reaction and the occasional appearance of tertiary lesions even after malarial treatment. Neymann is quoted in this regard, "Many times the theory has been advanced that an afebrile malaria may produce remissions in dementia paralytica. The proponents of this idea have neglected two important facts: spontaneous remissions occur in dementia paralytica, and malaria may run its course without chills or malaise. The fever may be overlooked especially if it occurs at night."

The author stresses the necessity of accurate measurement of the temperatures in the local tissue. For this purpose he uses special thermo-electric sounds. He points out that in the electric field of the short and ultra-short waves good conductors may cause sparks which may induce heat changes. He suggests that these difficulties may be corrected by using quartz thermometers placed in benzine or oil of paraffin.

In his experimental and clinical studies the author found that it was the heat which effected the cures, it made a direct attack on the spirochete and stimulated the normal and immunological defenses of the body, it also stimulated the sympathetic nervous system. There was no evidence that the electrical changes in themselves caused any therapeutic effects. When the primary lesion in man was submitted to intensive diathermy while the tissues were kept cool, no clinical improvement and no effect on the spirochetes was observed.

The author concludes that combined physiotherapy and chemotherapy are more effective in every stage of syphilis than either of these treatments alone. Treatment should be as early and as intense as possible. The author believes that the treponema

possesses a certain capacity for functional adaptation by which means it can increase its resistance to thermotherapy and chemotherapy.

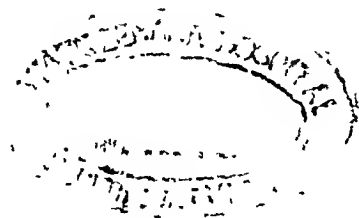
JACOB E. KLEIN, M.D.

Coulter, J. S., and Osborne, S. L.: Wavelength in the Heating of Human Tissues by Short-Wave Diathermy. *J. Am. M. Ass.*, 1938, 110: 639.

A new impetus has been given to diathermy as a therapeutic agent since the introduction of short-wave diathermy generators. The authors wished to determine whether, as found by other investigators, there is a selective thermal action of diathermy. Evidence has been presented by many workers that wavelength probably plays a part in the selective heating of non-living tissues.

This article is the report of 279 experiments carried out on adult male medical students averaging 170 pounds in weight. A thermocouple was introduced into the midpoint of the thigh for a depth of 2 in. The applications of the high frequency electric field were made with (1) pad electrodes, (2) air-gap electrodes, and (3) double-cuff electrodes, of the electromagnetic field with (1) coil technique, and (2) flat pancake coils or discs. Wavelengths of from 6 to 25 m were employed. As a result of their experiments, the authors believe that wavelength *per se* is not a marked factor in tissue heating in the living subject, but that differences in the machines, the energy delivered to the patient, and technique have important rôles. The electromagnetic field produces the most effective heating of live human tissues. The double-cuff method of the electric field is an effective technique. Air-spaced electrodes are effective for heating of the deep tissues, provided that the anterior surface application is used in accordance with the authors' outline.

HAROLD C. OCHSNER, M.D.



ing pain, diarrhea urgency, and tenesmus. Proctoscopy invariably showed telangiectasias and bleeding. Ulcers were present in 43 per cent of the cases.

Two cases of stenosis of the rectum due to intensive radiation therapy for carcinoma of the prostate are presented in order to call attention to its occurrence. In neither of the cases was anything suspicious noted in the first phase of the reaction except a slight and transient diarrhea with the occasional passage of mucus. In spite of this, both patients eventually developed the characteristic late symptoms after a symptom free interval: spasms of pain on attempt at defecation, diarrhea alternating with constipation, and marked tenesmus and bleeding with and after each bowel movement. On two occasions in one of the cases a proctoscopic examination made late in the course of the illness revealed a contracted edematous and bleeding rectal wall. The other case was not examined with the proctoscope but in both the autopsy findings demonstrated clearly the presence of marked edema and fibrosis producing stenosis. Telangiectasias were not observed but since they have been described frequently in such cases it is to be assumed that they were present, and accounted for the bleeding.

HAROLD C. OCHSNER, M.D.

Demerec M. Hereditary Effects of X-Ray Radiation. *Radiology* 1938 30 333

As an introduction to his discussion the author outlines the general biological principles involved. He describes cellular anatomy and proliferation and calls attention to the importance of chromosomes as carriers of hereditary units or genes. The genes possess the capacity of self reproduction and although they have a high degree of stability certain agents notably roentgen rays and related radiation can induce changes in them. Since genes are ultra-microscopic knowledge about them must be obtained through indirect methods. The current genetic concept assumes that the whole complex of genes of a living cell forms a balanced biological system. The appearance of the whole organism and the activity of a group of cells and even of a single cell are determined by the make up of that system. Changes in genes affect the balance of the whole system.

Since chromosomes are carriers of genes and genes are determiners of hereditary characteristics cytological observations have been utilized to demonstrate that roentgen rays induce pronounced changes in the hereditary material of a treated cell. For an analysis of hereditary changes breeding methods are more sensitive than cytological methods. *Drosophila* have been used extensively for this purpose and results obtained in work with them are used in this report to a large extent.

Experimental evidence indicates that roentgen rays can produce changes in the genes as well as gene eliminations. The effects are independent of the wavelength. The frequency of changes induced by roentgen ray treatment is directly proportional to the dosage applied. Sterility, due to killing or in-

activation of the sperm is the most noticeable effect observed in male flies treated with heavy dosages. A high death rate during embryonic development is responsible for other cases of sterility. If viable offspring ensue, a large proportion of them carry heritable changes which in the majority of cases, are abnormalities of various types. Some of these are dominant others are recessive. Abnormal individuals frequently appear among the offspring of the treated sperm in the first generation. Some of them are mosaics with one part of the body different from the rest. All of these effects of irradiation can be traced to changes in the heredity bearing material chromosome and genes and such changes are readily induced. Irradiation produces similar changes in ova and somatic cells.

In the author's conclusions it is stated that a great majority of detectable hereditary changes resulting from irradiation are detrimental to the organism. A great many of them are lethal to organisms as a whole and some are lethal even to a single cell or to a few cells. Experimental evidence suggests that a difference in gene sensitivity may be expected in different tissues of the same organism. Since changes in heredity carrying material can readily be induced in somatic tissues and since an appreciable proportion of these changes are lethal to the cell such a difference in sensitivity would readily explain the different lethal effects of irradiation in various tissues. This internal difference could account for reactions within the same organism whereby one tissue is injured or killed by a certain intensity of irradiation while another tissue may not show any detrimental effect at all. Similarly this situation can explain the different effects of radiation in the treatment of cancerous growth.

On the other hand the observed differences in sensitivity to irradiation show that biological factors play an important rôle in the effects of roentgen rays on living organisms. It is evident that different individuals may be sensitive to a different degree to roentgen rays and that a dosage which is beneficial for one individual may be injurious to another or may be ineffective for a third. Such differences are expected to be especially frequent in man since cross-breeding which is generally in force favors variability among individuals of the human race.

ADOLPH HARTUNG, M.D.

MISCELLANEOUS

Bessemans A. New Experimental Data on Medical Hyperthermia. (Nouvelles données expérimentales sur l'hyperthermie médicale). *Rev. belge d'ac. méd.* 1937 9 369

The author presents experimental data and tables showing the results of his studies on the effect of medical hyperthermia on experimental syphilis. The views and conclusions of various other workers in this field are cited especially atypical experiences which raise certain questions. He describes Herrmann's experience in a case in which general paraly-

Blalock, A., and Levy, S. E.: Studies on the Etiology of Renal Hypertension. *Ann Surg*, 1937, 106 826

A number of different types of experiments were performed in an effort to determine the mechanism by which renal ischemia results in hypertension. The results were summarized as follows:

1 When the remaining normal kidney was implanted in the flank and the blood pressure was normal, removal of this kidney under local anesthesia resulted in little if any alteration in the blood pressure.

2 When hypertension was produced by partial occlusion of the renal artery of an implanted kidney, the removal of the kidney under local anesthesia usually resulted in a slow decline in the blood pressure, with a return to normal in from six to ten hours. The rise in pressure was usually slower than the decline. Similar results were obtained in animals with only one kidney and in animals with a normal kidney in addition to the ischemic implanted one.

3 The rise in pressure which may be associated with occlusion of a ureter is abolished by the removal of the kidney, the pressure returning to normal in approximately six hours.

4 Various degrees of impairment of the renal arterial circulation were produced. These include: (a) total occlusion of all arterial supply, (b) total occlusion except for that through the ureteral vessels, (c) partial occlusion of the main renal artery by the Goldblatt method, (d) total occlusion of the main renal artery, (e) total occlusion of the main renal artery and capsular vessels, and (f) partial occlusion of the main renal artery and total occlusion of the remaining arterial supply. A significant elevation in the blood pressure occurred in a high percentage of all types of experiments, except those in which the kidney was entirely deprived of all blood supply, including that through the ureteral vessels.

5 When the blood pressure returned to normal following partial constriction of the artery to one kidney, removal of the opposite normal kidney usually resulted in a rise in the pressure.

6 Partial constriction of the blood supply to the single remaining kidney which had been completely denervated by transplantation to the neck resulted in a rise in the blood pressure. Release of the constriction or removal of the kidney under local anesthesia resulted in a decline in pressure to normal.

7 Similar results were obtained with the transplanted ischemic kidney when the opposite normal kidney was not removed.

8 Homotransplantation of a kidney to dogs with ischemia of both kidneys and hypertension did not cause a decline in the blood pressure.

9 The observations of Goldblatt to the effect that bilateral adrenalectomy abolishes experimental renal hypertension have been confirmed.

10 Subdiaphragmatic section of the splanchnic nerves, removal of the celiac and upper lumbar ganglia, and partial bilateral adrenalectomy do not abolish or prevent hypertension due to renal ischemia.

JOHN H. GARLOCK, M.D.

Van Prohaska, J., Harms, H. P., and Dragstedt, L. R.: Epinephrine Hypertension. *Ann Surg*, 1937, 106 857.

The authors discuss the possibility of treating hypertension by various operative procedures, namely those designed to accomplish a removal of vasomotor control over a large distribution of the vascular bed, and a diminution in the rate of secretion of epinephrine. The evidence in support of the theory that various forms of hypertension might be caused by the excessive production of epinephrine is also commented upon.

It is well known that an intravenous injection of epinephrine will produce a transient but very marked increase in the blood pressure. Experiments were undertaken by the authors to determine whether this hypertension might be maintained indefinitely by the sustained continuous injection of varying amounts of epinephrine. Using a continuous intravenous injection of epinephrine maintained by the method of Jacob for periods of from one hundred to three hundred and thirty-six hours, a sustained hypertension was produced in normal dogs. The amount of epinephrine required, however, was sufficient to cause death from the other systemic effects; the inhibition of motility of the gastro-intestinal tract and the derangement in carbohydrate metabolism were probably the most important. That the deleterious effects were due to the epinephrine was indicated by the fact that animals injected in the same manner with physiological salt solution tolerated the procedure for many weeks with no adverse symptoms.

The authors conclude that it does not seem probable that persistent hypertension in man will be found to be due to hyperadrenalemia.

JOHN H. GARLOCK, M.D.

Pusitz, M. E., Owen, A. K., and Finney, G. A.: Calcinosis Cutis. *J Am Med Ass.*, 1938, 110 360.

The subject of calcinosis of the skin and subcutaneous tissues is outlined, and 2 cases are presented. The authors state that although there are many references to this condition, there are only 18 cases in the American and English literature. In the 2 cases reported, the lower extremities of the patient were affected, and pain was the predominant symptom. Roentgenograms showed areas of calcification. In one patient the blood calcium was normal, in the other it was 15 mgm, but roentgenograms of the skull and extremities showed no significant bone changes. WALTER H. NADLER, M.D.

Brown, J. B., and Byars, L. T.: The Interstitial Radiation Treatment of Hemangiomas. *Am J Surg*, 1938, 39 452.

Arterial hemangiomas appear early in childhood and tend to grow in size, often involving essential tissues of the surface of the body, and occasionally destroying a feature. The eyelids, the nose, and the lips are frequently involved to such a degree that treatment sufficient to cure may deform the feature.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Bigler J A Clifton W M and Werner M The Leucocyte Response to Sulfanilamide *J Am Med Ass* 1938 110 343

Sulfanilamide caused a reduction of the leucocytes even to a point at which a leucopenia developed. Agranulocytosis or granulopenia did not occur with the reduction of leucopenia.

The action of sulfanilamide seemed to be independent of the leucocytes in that it did not produce an increase in the total number of leucocytes nor was there any increase in the proportion of the polymorphonuclear cells.

Cyanosis occurred in 7 cases but spectroscopic examination of the blood specimens in these cases did not reveal bands of sulfemoglobin or methemoglobin.

Sulfanilamide is a very effective drug in hemolytic streptococcus infections. Frequent blood cell determinations should accompany sulfanilamide therapy. SAUPEL KAHN MD

Bröchner Mortensen K. Uric Acid in the Blood and Urine. *Scand J Clin Lab Invest* 1937 Supp 84

Uric acid has been the subject of more studies than any other nitrogenous substance in the blood or urine. In 1834 Carrood had succeeded in demonstrating uric acid crystals in small quantities of acidulated blood serum by his famous thread test. Over a period of years a great number of methods have been devised for the quantitative analysis of uric acid in small amounts of blood and urine. As each method was found to be encumbered with some uncertainty it was modified or discontinued in favor of a newer technique.

The author criticizes the phosphotungstic method used currently by investigators and emphasizes that the weak point of the method is the difficulty of producing perfectly pure reagents as a pollution particularly with molybdic compounds cause other substances than uric acid such as phenols metals hydrogen sulphide aldehydes hexoses and pentoses to react, whereas the reaction of the uric acid may sometimes be inhibited. The method of uric acid determination based on the reduction of potassium ferricyanide which was devised by Flatow also may give very uncertain results. With a low pH (3) uric acid does not reduce a measurable quantity of potassium ferricyanide whereas with a pH of from 10 to 14 it reduces a maximal and constant quantity. Other factors resulting in variable results are the temperature of the solutions and time. Combining the methods of Flatow (Hagedorn Norman Jensen and Fujita Iwatake) he devises a method which is accurate within a mean error of 2 per cent. The detected values in serum averaged 1.5 per cent higher

than those derived from Folin's method (1933). The method is essentially the process of precipitation of the protein by sulphuric acid and sodium tungstate. A known sulphur of potassium ferricyanide and a buffer solution are added at pH 11. The quantity of non-reduced potassium ferricyanide is determined by iodometric titration. The same method is also used with no greater error on uric acid determinations of the urine provided that the uric acid in the urine is first isolated by precipitation with an ammoniacal solution composed of silver lactate and magnesium sulphate washed with ammonium sulphate and then redissolved in sodium chloride hydrochloric acid.

The amount of uric acid found in the blood of normal persons has varied considerably according to the analytical technique employed by various investigators. In general the lowest values were detected with the older methods. The author examined the serum of 50 normal adults using his technique. The mean value of the determination for males on a general diet was 0.9 mgm per cent on a purine free diet 0.1 mgm per cent for females the values were 0.1 mgm per cent and 0.3 mgm per cent respectively. When the patient was on a purine free diet for at least three days the variation in uric acid values was very slight. By administration of a diet very rich in purine a considerable increase in the uric acid of the serum was found, rising in an isolated case from 0.5 to 10.1 mgm per cent in the course of two days. The most constant values were found in the forenoon. Afternoon values decreased by an average of 1 mgm per cent. After meals containing no purine no changes were noted whereas increases up to 2.7 mgm per cent were noted in a period of four hours after a meal rich in purine.

The urinary excretion of uric acid was studied in 20 individuals. On diets containing no purine the subjects excreted from 269 to 532 mgm in an average twenty-four hour period. When the patients were on general diets the excretion increased on an average 100 mgm. After foods very rich in purine had been given an excretion up to 1,160 mgm was observed on isolated days. The uric acid clearance is approximately constant in the forenoon less in the afternoon and lowest at night. Aliments rich in purine increase the clearance in the course of from one to two hours with a rapid fall after this period. The increase in clearance rises to as much as 100 per cent. After intravenous injections the findings are very high. The increase in uric acid in the serum takes place more slowly.

The monograph shows a tremendous amount of detail of preparation and contains many charts and tables as well as detailed tabulations of the experimental material. It should be of great interest to the student of purine metabolism.

HOWARD B. CARROLL, M.D.

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(FRANZ) B. KINSKY.

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In another group of experiments a plane of cleavage was outlined between the biceps femoris and the semitendinosus muscles. The epimysium of the inner surface of each muscle was denuded by scraping with a scalpel and sheets of the materials previously mentioned were inserted between the muscles. After six weeks the allantoic membrane left the most definite plane of cleavage, while the cellophane and rubber latex not only caused severe tissue reaction but obliterated the intermuscular space. In the control experiments, the muscles adhered firmly by dense fibrous tissue.

A third series of experiments was made in which the sciatic nerve was exposed in the lower half of the thigh for a distance of 2 in. and a silk suture placed in the epineurium, above and below, to simulate an anastomosis. The five types of membranes were wrapped about the denuded area of the nerve and allowed to remain from nine to eighty-two days. In the control experiments, the nerve was found firmly adherent to the surrounding tissue. However, in the experiments in which the allantoic membrane was used the nerves were thickened but could be removed from the muscle bed with ease. This was in contrast to the fixation of the nerve in its bed when the other membranes were used. The impression was gained that microscopically the human amniotic membrane produced more reaction than the heef membrane.

The authors conclude from these experiments that allantoic membrane caused the least reaction about traumatized nerves and protected the nerve from the growth of scar tissue from the surrounding tissue bed. Even better results were obtained if the allantoic membrane was covered with a flap of fat.

In addition, in the parotid region the facial nerve prohibits direct surgical approach.

The best form of treatment for arterial angiomias involves surgical excision or cautery destruction. However, if this is undesirable radium is effective. Surface application of radium is efficacious only for growths on or very near the surface. The interstitial implantation of gold radon seeds is in the experience of the authors the most valuable single method of therapy when surgical excision or surface radium is not applicable, the preservation of facial features being the most important single benefit.

The same dangers attend this treatment as any other form of radium application and must be guarded against. The advantages are (1) insertion of the radon at the site where it is most needed, (2) applicability at sites where it is technically impossible to adequately attach and immobilize other agents and (3) the low total dosage required because of the even distribution of the emanation.

The seeds are introduced through hollow needles and are uniformly distributed through the tumor. The unit dosage is low, each seed containing 25 or 50 mC radon, the smaller dosages being used in more sensitive structures such as the eyelids and no more than one seed per cubic centimeter of tissue to be radiated is used. The minimum total dosage is first used and the treatment repeated if necessary; this procedure guards against damage to growing cartilage and bone or to the cornea if it be an eyelid which is treated.

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about a year. Then small dry superficial ulcerations developed on the finger tips associated with diminution of the tactile sensibility. During all this time there was a gradual increase in the size of the swelling in her neck. One day she developed an intense pain in her right leg which became noticeably pallid. Since that time there has been a slight hypoaesthesia in that leg. With medication and acetylcholine the ulcerations on the finger tips healed although the attacks of pain continued. One month prior to admission to the clinic there was a violent crisis of pain which lasted from four to five hours and was associated with a slight fever and ulcerations on the fingers; the middle finger even appeared gangrenous.

The patient appeared at the clinic in an emaciated state. The skin was dry, and pigmented brown. The mammary glands were markedly hypertrophied. The palms of the hands were also involved in trophic changes; the muscles of the thenar and hypothenar eminence were atrophic and the fingers were held in a semi flexed position. The pulse of the dorsal pedal arteries in the lower extremities was barely perceptible.

A large smooth swelling the size of a pigeon's egg was located in the left anterior cervical triangle near the midline and was apparently a part of the thyroid gland. Clinically there was no exophthalmos, the Moebius sign was absent, and there were no tremors. There was a tachycardia (100 to 120) the blood pressure was 115/85, the basal metabolism was increased from 8 to 10 per cent and the electrocardiogram showed a tachycardia of sinus origin with no clear evidence of a myocardial lesion. Pharmacological test with atropine, atropin and pilocarpine gave no evidence of sympathetic hyperaesthesia. The blood examination showed a three plus Minkowicz and Kahn reaction. The blood calcium was 12.5 per cent and the blood sugar 1.15 mgm.

The patient thus presented a very complex clinical picture which included some symptoms of Basedow's disease, a circumscribed scleroderma, a hypercalcemia without evidence of osteoporosis and a symmetrical gangrene of the fingers associated with symptoms of Raynaud's disease. It was suspected that the endocrine system was profoundly involved; the thyroid, parathyroid, adrenals and pancreas being affected. This was associated with instability of the sympathetic nervous system and vasomotor disturbances which caused the symptoms of Raynaud's disease. Despite the positive Minkowicz and Kahn tests, there was no history of clinical or evidence of hereditary syphilis. The husband also gave no evidence of syphilis.

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Another group of experiments was carried out to determine the value of various membranes in forming sliding mechanisms after tendon repair. It was found that the Achilles tendon when sectioned and resutured but not covered with any membrane healed with definite fixation to the surrounding structures by fibrous adhesions and did not loosen in dogs as late as the eighth week. The allantoic membrane about the Achilles tendon produced a peritendinous sheath which was less adherent and permitted free motion of the tendon.

Another group of experiments was carried out to test the efficiency of the aforementioned materials for the prevention of adhesions in the abdominal cavity. It was found that amniotic membrane with its mucous surface intact has the property of preventing adhesions between denuded surfaces. Allantoic membrane prevents the formation of adhesions between denuded peritoneal surfaces limited to the size of the membrane used.

The authors conclude that allantoic membrane has the property of decreasing the amount and degree of adhesions which form about injured nerves, tendons, and sheaths and denuded peritoneal surfaces.

ROBERT ZOLLINGER, M.D.

GENERAL BACTERIAL PROTOZOAN, AND PARASITIC INFECTIONS

Biasini A. So Called Human Botryomycosis (Contributo allo studio della cosa detta Botriomycosi umana). *Ann Ital di chir.* 1937 16 887.

The author reviews the literature of human botryomycosis and reports 3 cases. These cases were studied to gain more information concerning the cause and pathology of the disease. The cases presented the clinical picture of a small pea sized tumor on the skin, two on the hands and one on the chest. The tumor was rounded, pedunculated, red of elastic consistency, and bled easily when examined. The adjacent lymph glands were not involved. In all 3 of these cases the tumor and also the immediate surrounding skin were excised. No recurrences were reported.



Fig. 1

Pathologically the tumors resembled granulation tissue. There were many small blood vessels surrounded by connective tissue. Many vascular sinuses were seen and about these and throughout the tissue young fibroblasts and plasma cells were found. The surrounding skin was normal. The tumor was confined to the skin and subcutaneous tissues.

The bacterial culture from the tumors proved to be negative. Implantation of the tumors was injected into laboratory animals with no effect.

The condition does not appear to be of a neoplastic nature. The only treatment is surgery which will give good results if a generous excision is made.

HARVEY S. ALLEN, M.D.

DUCTLESS GLANDS

Maranon G, Richet C, Sourdel M, and Netter H. Disorders of Pigmentation of Pituitary Origin in Man (Les troubles pigmentaires d'origine hypophysaire en clinique humaine). *Presse Méd.* Par., 1937 45 1853.

Maranon and his associates note that experimental work has shown the presence of a melanophore hormone in the pars intermedia of the pituitary gland. This hormone has a stimulating action on the melanocytes or pigment cells of the skin. In human beings abnormal skin pigmentation has been noted by some authors in the presence of tumors of the hypophysis and by others in acromegaly. Cushing has stated that in cases of acromegaly the skin is habitually dark in color. The authors note that they have never seen an acromegalic patient who was a blond.

The authors report abnormal pigmentation of the skin which developed in 2 cases in which there was evidence of pituitary injury. In the first case the abnormal pigmentation developed after a trauma of the head which undoubtedly resulted in a hemorrhagic lesion in the hypothalamus or in the pituitary gland or both. It is well recognized that such lesion in the hypothalamus result in various disturbances of pituitary function even if the pituitary gland itself is not directly injured. In the second case the abnormal pigmentation developed in the course of diabetes insipidus associated with ocular symptoms which developed after a cranial fracture. The first patient also developed post-traumatic epilepsy on account of which a trephining operation was done and after the operation the pigmentation was markedly reduced. In neither of these cases was there any evidence of suprarenal insufficiency, so that the abnormalities of pigmentation must be referred to disturbances of the pituitary melanophore hormone.

In another case the authors observed abnormalities of pigmentation in a pituitary dwarf who showed a zone of depigmentation resembling vitiligo in the neck, with areas of brownish pigmentation on the thorax. In another patient with pulmonary sclerosis, areas of pigmentation on the buccal mucosa and on the skin would have passed unnoticed if there had

not been an associated polyuria, indicating pituitary, rather than adrenal, involvement. In general, abnormalities of pigmentation due to pituitary dysfunction are not as dark as those from adrenal insufficiency, they seem to develop more rapidly.

The authors suggest that the hyperpigmentation so often observed in pregnancy may be due to pituitary hyperfunction. Similar abnormal pigmentation may be observed in women with ovarian lesions, especially in polycystic ovaries, which are also associated with hormonal disturbances. It is suggested that vitiligo may also be due to pituitary hypofunction, as vitiligo or areas of depigmentation resembling it may be noted in persons with evidence of pituitary hypofunction, such as dwarfism or the adiposogenital syndrome. ALICE M. MEYERS

Cantarow, A., Stewart, H. L., and Housel, E. L. · Experimental Acute Hyperparathyroidism. II. Morphological Changes. *Endocrinology*, 1938, 22, 13

A state of acute hyperparathyroidism was induced in 6 adult dogs by the injection of from 2,700 to 3,500 units of parathyroid hormone over a period of seventy-two hours. Five of the animals were killed and autopsies were made at the end of this period.

Considerable variation was observed in the gross and microscopic changes, particularly with regard to the presence and degree of congestion, hemorrhage, edema, and calcium deposition. The authors did not obtain satisfactory evidence that the extensive regressive changes in the myocardium, kidneys, and stomach were dependent upon vascular phenomena, such as stasis and thrombosis. Degeneration and necrosis in these and other organs, thyroid, liver, skeletal muscle, are believed to be dependent upon a direct toxic effect of the parathyroid hormone. In this connection, the mechanism of action of the latter is conjecturable.

Peculiar focal fatty areas were present in the liver in every case. These areas resembled so-called fatty infarcts, which are apparently a rare lesion in this species. The term infarct is a misnomer in this connection, as the nuclei of the involved cells appeared to be morphologically normal.

A variable degree of calcification was present in the heart muscle, kidneys, particularly the tubular epithelium, and the stomach, arteries, duodenum, and thyroid. This was minimal in the animal presenting the highest average values for serum calcium and protein during the entire experimental period, and maximal in the animal presenting the lowest average values for these blood constituents. It appears that a low serum protein favors and a high serum protein limits the deposition of calcium in the tissues during periods of hypercalcemia induced by the parathyroid hormone.

The term "metastatic calcification" may not be applied properly to this process in acute hyperparathyroidism, for the calcium salts are apparently deposited in areas that have undergone regressive changes, but not in previously normal tissue. How-

ever, factors which are operative in true metastatic calcification, such as the relative alkalinity of affected cells, seem to have some influence upon the localization of the calcium deposits, as in the acid cells of the stomach and the renal tubular epithelium.

The absence of either degeneration or calcification in the tissues of 9 living fetuses obtained from one of the experimental animals at autopsy suggests that these changes are not dependent upon hypercalcemia *per se*, since this condition probably existed in the fetal circulation for some time during the experimental period. This observation also suggests that the parathyroid hormone does not pass the placental barrier in significant amounts. SAMUEL KAHN, M.D.

Wijnbladh, H. Surgery of the Endocrine Glands (*Die endokrine Chirurgie*) *Nord med Tidsskr*, 1937, p. 927.

The author refers to his previous publication in the *Zentralorgan fuer Chirurgie*, Ref. 64594, and to Hultén's lecture in the *Zentralorgan fuer Chirurgie*, Ref. 19094. The purpose of the present lecture is to clarify the theoretical assumptions and difficulties in the diagnosis of endocrine diseases, and to indicate the operative possibilities.

The whole endocrine system, the cortex, diencephalon, visceral nervous system, pituitary body, peripheral endocrine glands, and reaction organs, form to a certain extent a chain. Every link of this chain can be a primary focus of disease and consequently can call forth a definite aspect of disease. The condition of the reaction organs is important, the constitution and condition, for the final formation of the actual aspect of disease with its variations from case to case, for example, the different forms of hyperthyroidism and the thyrotoxicoses. It is doubtful whether the fact that a certain hormone in different concentration exerts different effects, stimulation or inhibition, is of any pathophysiological significance. On the other hand, one hormone can increase the effect of another through activation or sensitization, for instance, thyroxin and adrenalin, also one hormone can produce the secretion of another as, for instance, adrenalin and insulin.

In the endocrine system, we distinguish centrifugal reaction and centripetal reaction, the anti-hormone theory of Collip is to be mentioned in this connection. When a centripetal irritation leads to the formation of an antihormone so that the occurrence of a manifest syndrome is prevented, we call it a hypophyseal compensated endocrine disturbance in equilibrium. When the chromophile elements are disturbed in several functions, it is a question of a complicated disturbance in equilibrium, which can produce an effect on the peripheral glands through collateral inhibition, for instance, a disturbance of the thyroid, hypophyseal, and ovarian function. The condition of the reaction organs is significant for the efficiency of the hormones, with regard to the "condition" according to Ascher, and with regard to the distribution and concentration of unspecific tissue hormones according to Kisch.

On the basis of these general principles of endocrinology, we perceive the difficulties which appear as a result of investigation and analysis of definite clinical cases. Neurocirculatory asthenia according to Crile, which he treats with partial extirpation of the suprarenal capsule resembles the atypical toxic goiter according to Hertzler who has successfully treated it by thyroidectomy. Doré calls a similar condition 'hypersympathicotonia'. In diabetes mellitus and in certain cases of diabetes insipidus total thyroidectomy can be also done on the basis of a similar theoretical assumption of hormonal interplay (Rudy, Blumgart and Berlin). An example of centripetal inhibition from a special glandular tropic hormone is the action of a parathyroid adenoma on the remaining tissue of the parathyroid glands. Even purely mechanical causes can lead to secondary injuries of the other endocrine organs. There is also the theory that the accessory thyroid is influenced by the bleeding increased by disease of the thyroid gland in thyroid toxicosis. Similar to thyroid toxicosis as a complete aspect of the disease picture the following can also be taken into consideration from various angles: diabetes mellitus, diabetes insipidus and the syndrome of Simmonds, the last from the tuber cinereum, from the hypophysis or from the cortex. Surgically an increased function can be stopped by complete or partial removal

of the diseased superactive organ by vascular ligation or by denervation such as the gynecological *sympathectomy* of Cotte.

Moreover there remains the possibility of attacking the disease not merely through the affected organ but also by shunting off a relay organ (Eisler, Reiterer, Lembo). An attempt has been made through ligation of the excretory duct to bring about an increase of the endocrine function in glands of internal and external secretion in case of testis insufficiency. Periaxillary sympathectomy was tried. The syndrome of Cushing can be freed from the basophil hypophysis adenoma according to a report by Kessel. A similar picture is presented in cancer of the thymus gland. The author gives additional reports on 3 cases of superactivity of the parathyroid glands. One was treated successfully without an operation, another was treated surgically in 1932 and resulted in complete recovery, the third case was operated upon in 1937 and showed improvement.

In conclusion the author discusses the various types of toxicosis of the thyroid gland. Emphasis is placed upon the advantages of Plummer's treatment with iodine as well as on the great assistance resulting from the possibility of administering parathyroid hormone in postoperative tetany and oliguria.

(GIESLACH) CLARENCE C REED M.D.

INTERNATIONAL ABSTRACT OF SURGERY

AUGUST, 1938

PRINCIPLES OF SURGICAL PRACTICE

THE COVERING OF RAW SURFACES

JAMES BARRETT BROWN, M D , F A C S , St Louis, Missouri

IN dealing with raw surfaces of all sizes and depths, occurring in all areas of the body, there are many factors worthy of detailed discussion, but, in this instance, a somewhat tabulated general view of the subject has been prepared, from the study of a large series of skin grafts, and from work done and published previously (1-11)

PARTIAL-THICKNESS LOSS OF SKIN

Raw surfaces result most often from burns, and, if there is rapid widespread healing and return to function without much scarring or deformity, this means that the full thickness of the skin has not been lost, and that regeneration has occurred from the deep glands in the derma, much the same as occurs in the donor site of a thick split graft (Fig 1) This point of rapid healing in partial-thickness losses is of importance in evaluating various types of treatment of burns, because, when it is claimed that a certain method will insure complete healing without scarring, it is apparently not realized how healing occurs

FULL-THICKNESS LOSS OF SKIN

If the full thickness of the skin is lost over a large area, the result is a raw surface or open wound, regardless of the type of treatment employed The size of these defects is relative for various parts of the body a loss on the eyelid or back of the hand of only a few square centimeters may be as crippling as a very large loss over the flank or thighs

From the Department of Surgery, Washington University School of Medicine, St Louis, Mo

SPONTANEOUS-HEALING TENDENCIES

In the consideration of the healing tendencies of large raw areas, it is recognized that there are marked individual variations in the epithelization of these wounds An occasional patient may present healing of a large full-thickness loss without deformity (Fig 2-A), and others may grow epithelium that is of great benefit and may even be life-saving, but as a general rule this is not the case, and the patient is left to one of the following fates

1 The large wound may show extreme epithelial activity at the edge, but have it all expressed in a piling up of keratin, and the edge may become practically a stationary condition, even with a tendency to turn under itself, but with no progress across the open wound (Fig 2-B and C)

2 There may be no activity apparent at the edge, either of a spread over the granulating area or of the above-mentioned piling-up In these patients there seems to be no epithelial response to the wound stimulus and, with continual loss of body fluid and debilitation, death may occur (Fig 2-D)

3 The area may actually heal completely at times, only to break open again and pile up excessive keratin as an active response to the wound stimulus of tension and inflammation It is in this type that cancer is most likely to develop, although it occurs at a distant date and very infrequently.

4 If even small, deep wounds are allowed to remain in a dirty condition, and if pain is permitted to go uncontrolled, debilitation and death may occur

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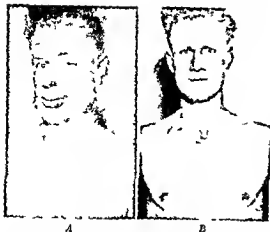


Fig. 1. A Patient with widespread burn of face (and arm) in hospital eleven days with open surgical drainage including soap and water cleaning, gentle débridement and fine mesh gauze over the entire area. B Completely healed without deformity because there had been no full thickness loss of the skin.

PAIN AND CONTRACTURES

The foregoing possibilities have been concerned with the epithelial healing, but the center or granulating surface itself and the underlying functioning parts should also be considered. When a large wound has been open over a long period the pain usually becomes most severe, presumably from more nerve endings developing in the bed; this forms a bad cycle for any proper wound care and is one of the underlying causes of morbidity and death in old unhealed burns since both the patient and the attendants may become unable to cope with the situation (Fig. 2 D).

The second consideration of the whole area is one of contracture and deformity of the surface, tendons and joints. Displacement and friction due to skin and surface contracture as the wound pulls in toward the center may be called *primary contracture*. All wounds exhibit this type of healing and the more lax the area is the easier the healing with the least apparent deformity, but widespread losses will soon lead to primary contracture and disability (Fig. 15).

Secondary contractures may be considered those that occur in underlying tendons which though not damaged directly, have been held contracted so long both voluntarily and later by the overlying scar that they are actually shortened (Fig. 1).

SCAR EPITHELIAL HEALING

The thin scar epithelial healing that is so important in saving life and in turning dirty raw

surfaces into clean healed areas is many times not of sufficient strength to give the permanent surface necessary for the area. The scar epithelium is dry, may form excessive keratosis, is subject to cracks and irritation and may break down over large areas on slight trauma or circulatory disturbance.

The reason for this unsatisfactory healing may be clearly shown microscopically. The scar epithelium lies on a fibrous tissue base, the fibers of which usually seem to be arranged parallel with the surface. This fibrous tissue may be of excessive thickness and have a very poor blood supply. The scar epithelium that has regenerated over the area has no normal derma to support it and attach it to the subcutaneous tissues. The cells have extended out over the base in almost a straight line so that there are no or very few papillae present. The epithelium itself is devoid of hair and sebaceous glands, it may be but a few layers of cells thick in one place and close by show marked hyperkeratosis (Fig. 4).

In some patients who present healing after widespread burns, there may be no actual deformity but a general tightness of an area with perhaps some limitation of motion of an extremity. These patients frequently need more skin surface and a release of the general surface tension is effected by a simple opening across the tightest portion of the contracted area, which allows the edges to retract, and then the insertion of split grafts into the open area. This condition may be called a 'generalized skin shortening' and in some instances there seems to be a sort of bursa formation under the heavy scar surface (Fig. 5).

OBJECTS OF TREATMENT

General. The general care is of primary importance and includes the exercise of patience and gentleness and interest in the patient's welfare by all who come in contact with him. The patient should be kept free from pain and from objectionable restraints, sedatives should be used carefully and an interest in the surroundings should be developed especially when the patients are children. Nutrition must be kept up and transfusions may be required frequently (5).

Local. In view of the possibilities outlined it may be seen that the local care of the open wounds has for its object the cleaning up of the areas as quickly as possible so that the lost surface may be restored with skin grafts before damaging contractures have occurred and before debilitation and pain have developed beyond control. Surgical drainage is best accomplished by the use of

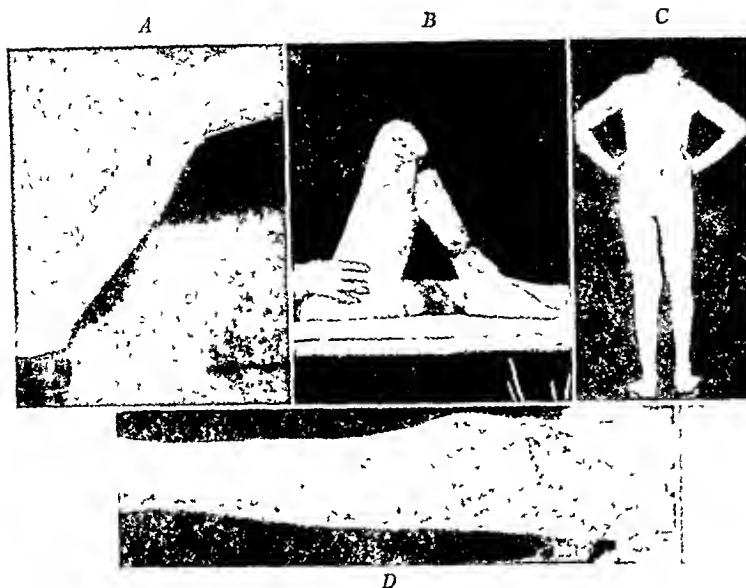


Fig 2 *A* Result of spontaneous healing in seven weeks of a large full-thickness loss with the use of alternate saline soaks and fine-mesh grease gauze dressings. This represents the occasional patient who heals rapidly and firmly. Repeated ulceration may still occur and require grafting. *B*, Keratotic edge of a large loss that has not healed in one and one-half years and probably never would heal spontaneously. *C* Same leg as in *B* healed in 1 opening operation and 2 split-graft operations. One split graft, taken from the former donor site of small deep grafts, can be seen in the popliteal space. *D* Total failure of epithelization and formation of granulations when first seen three months after a burn. Pain and general debilitation and failure of response of the wounds to the usual active measures employed resulted in death after two weeks. Patient might have been saved if early successful grafting could have been done.

saline dressings or by the continual saline bath for from one to three hours a day followed by dry heat or further wet dressings. Many antiseptics, common and proprietary, and gentian violet may be used, but Dakin's solution is usually relied on if anything other than saline solution is thought necessary (5) (Fig 6).

A firm pressure dressing that is kept moist by irrigation, combined with elevation, may be of great advantage for lesions of the extremities, marked improvement may be noted within forty-eight hours (5).

Pain should be kept down to a minimum when the dressings are removed. They may be soaked off gradually in a bath. It is important that some protector is used next to the wound to prevent the granulations from growing up through the meshes. For this, old linen, perforated cellophane-like material, or very fine mesh gauze is usually satisfactory so that dressings can be removed even from children with a minimum of discomfort. When cellulitis is controlled, grease dressings

(xeroform 4 per cent, zinc oxide 5 per cent, or scarlet red 5 per cent)¹ on fine gauze or linen can be used, these allow the patient greater freedom, but they are not to be used for several days immediately preceding operation. Gentle mechanical cleansing of wounds daily with soap and water is important, but care should be taken not to disturb epithelization (5).

Surgical drainage and pressure dressings usually produce bright red, firm granulations in the wounds, free from surrounding cellulitis. Bacteriological studies have shown that it is probably easier to get sterile cultures from small wounds than from very large open areas. A thorough Carrel-Dakin technique is an advantage, but careful evaluation of the general condition and of the gross appearance of the granulations and surrounding tissues usually suffices for the determination of the time for operation. *Bacillus pyocyaneus* is one of the worst organisms to contend

¹There are so many ointments for use on wounds in current use that they all cannot be included here (cod liver oil, paraffin, sulphy dryl-containing compounds, allantoin, mercurals).

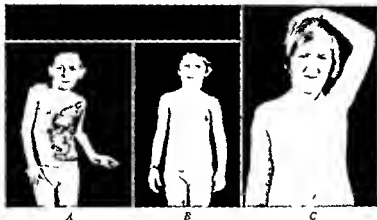
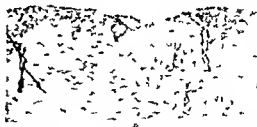


Fig 3 A Very large full thickness loss with secondary contracture B Complete healing in two split graft operations and prevention of growth of arm to side after five months C Complete function and permanence of original repair shown one and one half years later



Fig 4 A Scar epithelium the result of spontaneous healing Typical scar base thin flat epithelium without hair glands or papillae with a heavy L-rain layer indicating marked cellular activity presumably the result of the continued wound stimulus of the open area and the surrounding tension Red blood cells the result of trauma can be seen just under the epithelium ready to lift it entirely



of its scar in the bed as is shown completed in the next figure B The scar epithelium has been completely detached from its underlying scar base which is a step farther along in the untableness of scar epithelium than the preceding figure This is an actual traumatic denudation and not an artifact produced in the laboratory Normal epithelium cannot be stripped up in this manner (1)

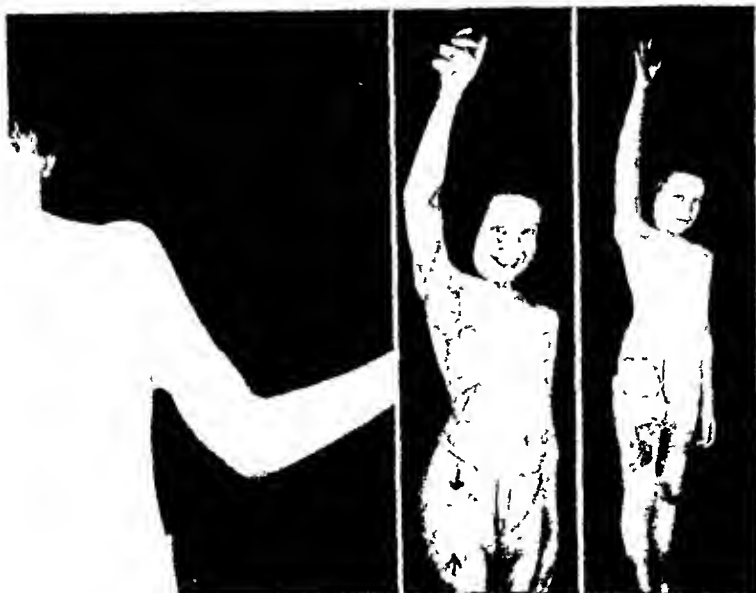


Fig 5 Generalized skin shortening throughout the trunk and axilla, relieved by one operation on the axilla and one simple one across the hip by opening the scar between the arrows, allowing the edges to retract, and then covering the open area immediately with thick split grafts as outlined. Fresh donor sites visible on thighs (5)

with in skin grafting, but soap and water frequently followed by 5-per-cent gentian violet or a mercurial dye antiseptic seem to give fair results (5)

Another important result from the use of the saline bath is that ordinary secondary contractures will have been straightened out by the voluntary effort of the patient without the use of traction or restraints. Most patients are extremely grateful for the bath and realize their first comfort in it, and it has occasionally been a life-saving measure. There may be a bad reaction to it, however, and there is frequently an elevation of temperature. If any of these bad effects are too severe, the bath may be omitted at least temporarily (5)

When out of the bath, patients can be kept comfortably warm in a covered bed with or without dressings. This allows the patient free movement and makes the nursing care somewhat easier (Fig 6)

TYPES OF FREE SKIN GRAFTS FOR MAKING REPAIRS

A consideration of the histology and thickness of the skin is of some importance in relation to the various types of free grafts

The *Riverdin* or *pinch graft* includes a shallow thickness just through the epithelium and has a

surface area of 0.5 sq. cm. or less. It happens to be the least useful of all the types of skin grafts, and one usually finds that thicker or deeper sections of the skin give much better results. This thicker graft has been reported on extensively by Davis who has suggested the term, "small, deep graft." It will grow in many fields where others



Fig 6 Simple equipment for saline bath of a portable tub and a bent Bradford frame. The bed is covered for warmth, irrigations can be maintained here if desired. Patient being cared for by Robert Smith, Assistant Resident Surgeon at Barnes Hospital

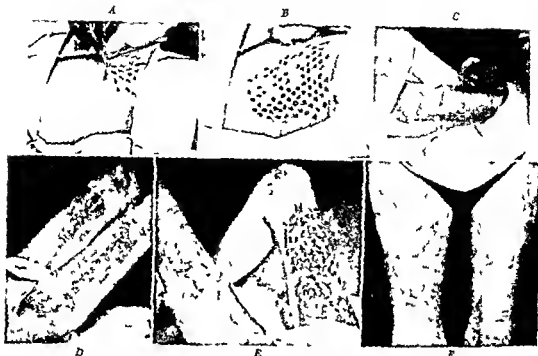


FIG. 7. Small Deep Grafts (Same technique for Reverdin grafts). A Straight needle on a clamp lifting a cone of skin which is cut off and left on the needle for transferring to the raw area. B Donor site. C Grafts firmly in place and the beginning of a very careful dressing with fine mesh xerulform or scarlet red gauze ready to snub the grafts in place. This is covered with pads and tightly bound gauze rolls. A continuous wet dressing may be used if

indicated. D Very clean areas of full thickness loss practically same extent on both legs. E Six days after the punch graft operation (under local anesthesia) with all grafts viable. The opposite leg in the meanwhile has been covered with thick split grafts. F Final result seven months later. The roughness of the right leg does not matter much since it is covered. The final bearing support of the leg is about five months behind the left leg.

will not but oftentimes, because of this fact, little attention is paid to the pre operative preparation of the wound with the result that many of these grafts are lost. They are most valuable for areas that are covered by clothing as they give a rather spotty appearance. They are also of service at times for hastening healing in areas that cannot be made clean enough for other methods of grafting or where other methods have failed. Not the least advantage of this particular type of graft is that the operation can be performed simply under local anesthesia (Fig. 7).

Ollier Thiersch grafts are usually thought to contain only the epidermis but they are cut in sheets of skin in contrast to the small bits taken as punch grafts. In reality even the thinnest Ollier Thiersch graft usually includes a thin layer of derma. These grafts are too thin to be of much use in making large repairs where there must be a firm surface.

Thick split grafts. After one has tried to use the thin Ollier Thiersch graft, he will almost automatically cut deeper. A graft of from one-half to three-fourths of the thickness of the whole skin is perhaps the most useful in making all repairs of raw surfaces. This graft could be designated as a 'thick Ollier Thiersch' or as a 'thick split graft' (Fig. 8).

Where large areas are to be covered it is necessary to obtain large pieces of these grafts without cutting entirely through the derma so that healing of the donor site can occur rapidly from the epithelial glands that are left behind in the lower layers of the derma. Rapid healing of the donor area is most important as it makes large amounts available at one time. One hundred square inches are frequently taken and as high as 180 sq in have been transferred in one operation.

The deep glands in the derma 'de-differentiate' into squamous epithelium and cover the surface in from six to eight days and in from

twelve to twenty days no dressing is necessary. This dedifferentiation can be shown clearly in microscopic sections, and, if healing is uninterrupted by infection, successive "crops" of skin can be cut from the same area, as high as four crops having been taken from one area. There is a marked variation in patients in the regeneration of the surface; it is usually several weeks before a second graft can be taken, but such a graft has been obtained as early as nineteen days after the previous "crop" (Fig 9).

The donor sites are dressed carefully with greased fine mesh gauze and the dressing is allowed to remain from ten to fourteen days. Silver foil or tannic acid may also be used. Healing occurs most promptly when there is little or no activity

The cutting and application of split grafts The most essential equipment is a very sharp, long knife of the amputation variety. With this long knife large grafts may be cut rapidly, and the larger they are the more easily they may be applied, grafts up to 18 by 5 in. may be obtained from suitable thighs. With the suction retractor, described in 1929 (1, 5), or by elevation of the

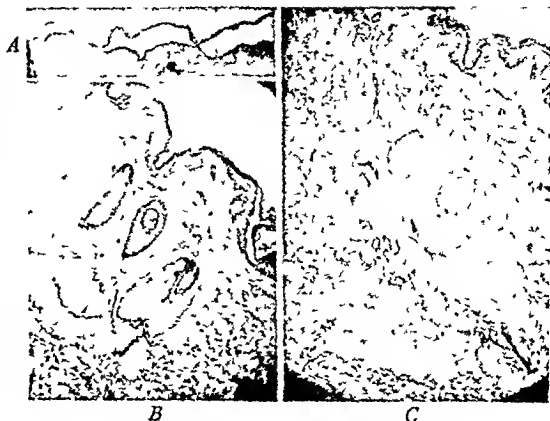


Fig 8 *Thickness of Skin Grafts* All three grafts cut from the same area from a single patient and photographed under the same magnification. *A*, Average Ollier-Thiersch thickness. Most texts state that the skin is taken through the papillary layer, but even the thinnest ones usually include some derma. *B*, A thick split or thick Ollier-Thiersch graft. The thickness shown here is greater than generally used. It can be roughly graduated between one-third and three-fourths of the full thickness. *C*, Full-thickness graft, not quite all of which is gotten in the field of magnification.

skin with large tenacula, fairly large grafts may be cut even from the abdomen



Fig 9 *Healing of Donor Sites.* *A* Biopsy from donor site of split graft after two days, showing deep glands and uncovered surface. *B* Biopsy from patient five days later. There is complete surface coverage with squamous



epithelium that has "de-differentiated" from the deep glandular epithelium. The connection from the deep gland to the surface can be seen in one area. Biopsies done by Drs L. T. Byars and Fay Comer

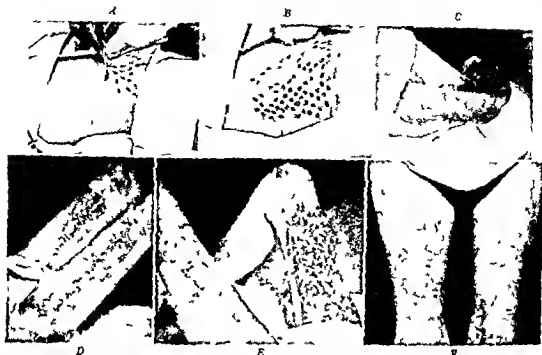


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Thick split grafts After one has tried to use the thin Ollier Thiersch graft, he will almost automatically cut deeper A graft of from one-half to three fourths of the thickness of the whole skin is perhaps the most useful in making all repairs of raw surfaces This graft could be designated as a "thick Ollier Thiersch" or as a "thick split graft" (Fig 8)

Where large areas are to be covered it is necessary to obtain large pieces of these grafts without cutting entirely through the derma so that healing of the donor site can occur rapidly from the epithelial glands that are left behind in the lower layers of the derma Rapid healing of the donor area is most important as it makes large amounts available at one time One hundred square inches are frequently taken and as high as 180 sq in have been transferred in one operation

The deep glands in the derma 'de-differentiate' into squamous epithelium and cover the surface in from six to eight days and in from

not as certain in contaminated fields as that of the split graft. This graft has been used extensively in this series, but it was used in healed deformities in which it was believed that a clean operation could be done (Fig 15). Douglas described a "sieve graft" for the covering of leg ulcers in which the full thickness of the skin was used except that holes were punched through it before it was raised, to provide islands of epithelium in the donor area and to allow better drainage through the graft. Other methods of cutting the full-thickness graft have been described, one of them has been to take a full-thickness graft, then cut relaxation incisions in it to allow stretching and, therefore, more coverage and also better drainage from beneath.

Other types of grafts are "implantation grafts," which are pinch grafts that have been implanted deep in the granulations, and "tunnel grafts," in which small strips have been threaded through under the surface of healed scar.

Homografts and delayed grafts By using autogenous split grafts wherever possible, the donor areas are preserved fairly well, and one is able to find skin enough to make acceptable repairs in most patients.

Fresh homografts are employed only when it is thought that the patient cannot stand a long operative procedure and when there is no sign of spontaneous epithelization. Homografts will usually take satisfactorily, but are absorbed in a few weeks. However, the few days' respite that the patient receives while these grafts are in place may actually be a turning point in his recovery and there may be an increased spontaneous epithelization (Fig 10).

It is hoped that some method of getting homografts to persist may be developed, this is one of the most important things that could be ac-

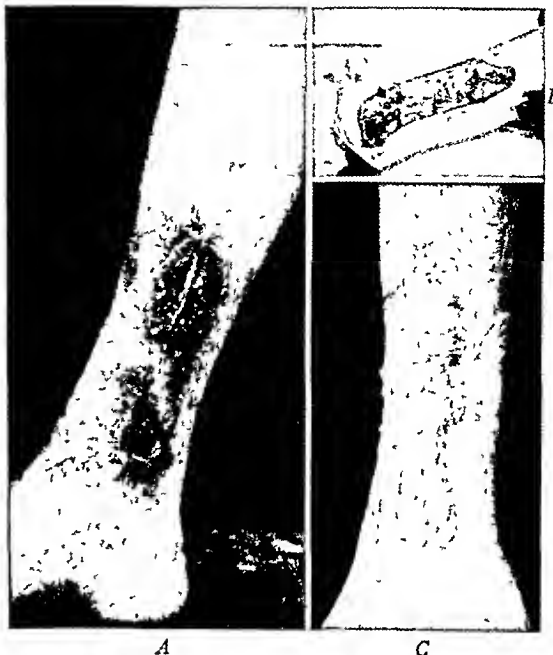


Fig 11 A Ulcer of six years' duration B, Deep excision has been done including a large area of surrounding "scar" epithelium C, Healed in one operation with a single large thick split graft. This procedure is used frequently on scars of old osteomyelitis.

complished in reconstructive surgery. At the present time, work is being done on the sub-blood groups with the assistance of Frances E. Holford of Wisconsin University, Department of Bacteriology.

It is possible to use successfully autografts that have been stored for several days, but this fact is not very important clinically, especially



Fig 12 Restoration of a large, extremely painful loss with a single split graft which was sewed on carefully. The dressing was kept wet by the application of saline irriga-

tions for four days. The final result is practically normal skin (except for hair) that can be used in the reconstruction of the ear.



Fig 10 Homografts Delayed Grafts Sutures for grafts Healed donor site Restoration of complete circular loss of thighs A Full take of fresh homografts from mother shown four days postoperatively These gave good local and general improvement but were completely absorbed in two and one half weeks (B) B Full take of fresh autografts after four days showing stab holes and suture fixation Also shows small experimental homograft that has a partial take it had been stored in an icebox for six weeks It was completely gone in ten days C Final result showing part of area that was covered and also well healed donor site on opposite leg

These grafts are applied to the area after granulations have been carefully and smoothly shaved off after any healed contractures have been fully opened by dissection, or after scar tissue has been excised. They are held firmly in place with running horsehair or ooo-silk sutures all around and multiple mattressing sutures over the surface. Many stab holes are made through the grafts to provide for drainage. It is important to note that the removal of granulations causes a good deal of bleeding and that over large areas it must be done very carefully or even omitted if the patient can not stand the added bleeding (Fig 10).

For very flat surfaces such as legs and thighs if the granulations are very firm the grafts may be spread out over them and then snubbed in place with a sterile fine mesh roller bandage that has been wet in saline solution. The rolls of the bandage should press the graft out firmly without wrinkling and be secured with many turns so that no displacement can occur.

If the wound has been quite dirty originally and refractory to treatment before operation or if there are any reasons to fear a degree of infection that might damage the graft, a wet saline dressing with irrigation tubes incorporated in it is applied and pressure is obtained over the area with sea sponges bound on firmly with heavy gauze rolls. The dressings are constantly kept moist for from three to four days after which time the first dressing is changed.

If the area is small and quite free from contamination, a sponge pressure dressing is applied with a few layers of grease gauze over the graft instead of the wet dressing.

On flat surfaces the bandage may be made so smooth and firm that no sponges are necessary.

Extreme care should be taken with the dressings which are done first on the third or fourth day the graft edges are trimmed away, sutures are removed, and some mild antiseptic is painted over the area. If there is not much cellulitis, a fine mesh, grease (xeroform or scarlet red) gauze dressing can be used but, if infection is present, another wet dressing should be applied.

Late course of split grafts. Operations may have to be repeated to let in more skin or to relieve later contracture. There is usually a stage of wrinkling and often of sebaceous collection in the graft. Active movement of the parts best tend to withstand the underlying contracture and for this reason this type of graft is especially suited to repairs in such powerful areas as the axilla, thigh and popliteal regions. The sebaceous collections can be emptied out as they occur, and after from six to twelve months many of these grafts appear as the natural skin of the area. Of course when they are put on uneven surfaces this roughness will persist (Fig 12).

Full thickness grafts are not put over large raw surfaces because the size required is prohibitive and the take of a full thickness dissected graft is

not as certain in contaminated fields as that of the split graft. This graft has been used extensively in this series, but it was used in healed deformities in which it was believed that a clean operation could be done (Fig. 15). Douglas described a "sieve graft" for the covering of leg ulcers in which the full thickness of the skin was used except that holes were punched through it before it was raised, to provide islands of epithelium in the donor area and to allow better drainage through the graft. Other methods of cutting the full-thickness graft have been described, one of them has been to take a full-thickness graft, then cut relaxation incisions in it to allow stretching and, therefore, more coverage and also better drainage from beneath.

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Fig. 13. *Face and Neck Burns.* A. Marked deformity and failure of healing after several months with extreme pain about the open areas. B. First repair was made with split grafts over the painful open areas to obtain complete healing and freedom from discomfort. Subsequent releases of lips and neck also done with free split grafts.

with regard to split grafts, for the latter can be cut rapidly and add but little time to the operation (5, 8).

Pedicle flaps. Heavier restoration than free skin grafts is occasionally necessary, and direct or delayed pedicle flaps are then used. These

flaps are most frequently necessary on the hands and feet following very deep losses.

CONSIDERATIONS OF CERTAIN REGIONS AND LESIONS

Grafting open areas first and at another operation releasing deformity and completing the grafting. In repair of areas that are of long standing and complicated by primary and secondary contractions it is often safest simply to graft the open areas first without opening the contractures. This is to obtain healing even in a deformed position so that the surface can be clean enough later to permit a deeper opening into the contracted area without fear of the spread of infection and the entire correction of any deformity. At this time the new clean raw areas may be covered completely with grafts. If any dirty sinus tracts exist, they should be opened widely as a preliminary step so that they can be cleaned the same as any other raw area (Fig. 13).

Axilla, chest, body, popliteal areas and leg. All of these areas with large open surfaces may be cleaned practically the same way and covered satisfactorily and permanently with thick split grafts in relatively few operations. It is recog-



Fig. 14. *Fresh Burn of Hand.* A and B. Complete burns of both hands from falling in a fire. Cared for as described in text and ready for grafting in twelve days. C and D. Result of one operation in which both hands were dressed in split grafts that is a large graft was put over the entire area and sutured accurately in place. There was growth of the graft over the raw parts and it was trimmed away where the surface regenerated. Patient cared for by Drs. McDowell and Guiss. Surgical Service at Barnes Hospital.

nized that this is at variance with some authors who state that full-thickness grafts or even pedicle flaps are necessary for repairs of the axilla and popliteal areas. Bad contractures in these areas may require such extensive dissection in freeing them and the resultant edges and surface be so rough that immediate grafting is not practical. The fresh wound which results can be kept clean and covered in a few days when it has smoothed out, or the delay may be longer until a good firm, granulating surface is established (Figs 2-B and C, 3, 5, 7, and 10).

Raw areas following radical breast operations can be grafted immediately, but both on the chest and abdomen, the respiratory movements may make satisfactory dressing difficult.

Leg Ulcers If the areas can be made clean enough for grafting, the split graft will give adequate support for the lower leg. The problem of preparation includes bed rest, elevation and elastic pressure support of the leg, and mildly antiseptic wet dressings. The granulations are usually shaved off, and if there is a non-granulating base, this is removed, as it is necessary to get down to a blood supply. Postoperative care is important for protection of the graft and support of the blood column.

The old ulcers and scars of osteomyelitis may be excised and covered with split grafts or a double pedicle flap swung over the tibia, and the defect on the side grafted. For draining sinuses in the bone, grafts may be used directly, but it is usually better to saucerize the bone widely, allow healthy skin edges to drop over the cortical bone edges, and then graft the fresh granulations when they approach the skin level (6, 7) (Fig. 11).

Radiation burns Immediate free-skin grafting after excision of radiation burns has been so hazardous that some operators have preferred to wait for fresh granulations to form before covering the defect and others have preferred to use pedicled flaps. Frequently the thick split graft can be applied immediately, however, and a permanent surface obtained, although failures may be expected (6).

Penis, inguinal, and anal regions. When the skin of the penis has been lost, it is thought that free thick-split grafts may suffice for a suitable repair in most instances, and they could be used to effect early healing in ulcerated cases, even if a thicker pedicle-flap repair might have to be done at a later date (9).

In uneven areas that are heavily contaminated, such as these, the main pre-operative preparation will necessarily be soap and water cleansing and saline baths. The grafts will have to be applied

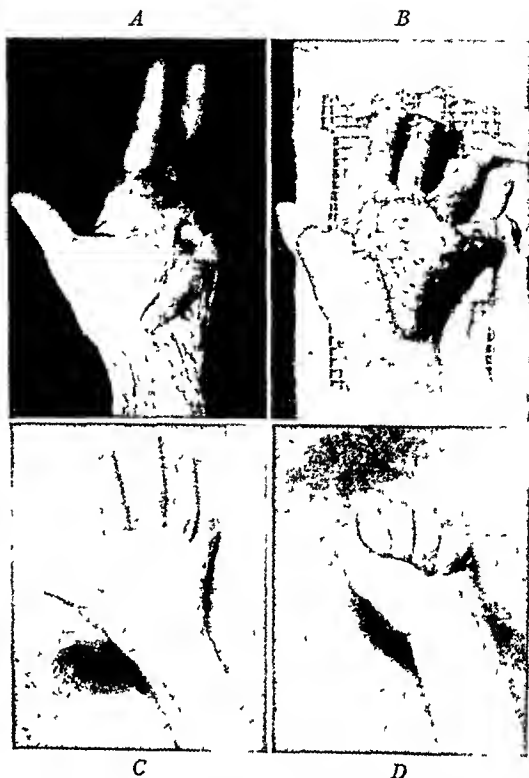


Fig 15 A Late contracture of the hand due to surface loss without tendon loss B Full-thickness graft restoration after complete freeing of the scar extension of the fingers C and D Complete and permanent function shown two years later, from the one operation

carefully and held in place, usually in the inguinal and anal regions, and large gauze folds must be anchored over them with heavy stay sutures tied from side to side. In this instance the main aseptis is firm pressure, much the same as a "stent" graft in the mouth.

Scalp and bare bone. On the scalp, scar epithelium is slow to form and usually gives an unsatisfactory surface with a marked tendency toward repeated ulceration. It is probable that carcinomas develop most frequently in burn scars of this area. Thick split-grafts will suffice for early and permanent covering in practically all cases. Even in the total restoration of foreheads there is little advantage in full-thickness grafts.

Free-skin grafts will grow on viable periosteum, but will not grow over bare bone, and, therefore, when bone is exposed, growth may finally occur by a bridging over of scar epithelium, or it may be necessary to wait for separation of the bone fragments if there is a necrosis (Fig 12).



Fig. 16. A Wide loss from infection in an inguinal gland biopsy. B Complete healing in one split graft operation. Freshly healed donor site on inside of right thigh.

Rapid healing in this type of misfortune is important both to the patient and hospital. Patient operated on by Dr. James Pittman, Asst. Resident Surgeon at Barnes Hospital.

Face Raw areas of the face usually heal quickly and because of this, they are often allowed to do so, and then repairs are made later. This procedure is somewhat influenced by the involvement of the features which may require pedicle flap or full thickness graft repair. However if there is continued pain or other reason for hurrying the healing any area on the face may be cleaned up and grafted temporarily to await final repair of any damaged features (Fig. 13).

It is definitely best not to use Riverdin or small deep grafts on exposed surfaces of the face, neck, arms, and hands.

Hands In burns of the hands every effort should be put forth to prevent the deep infection that will so rapidly fix tendons and joints and produce deformities that may never be overcome. The first treatment should be soap and water cleansing and gentle debridement then the hand should be wrapped in fine mesh grease gauze and bandaged. A daily saline soak from one half hour to an hour and a new dressing with further debridement can then be carried out until the wound is ready for grafting when it is best to discontinue the use of grease dressings if possible. This method might be called surgical drainage in contradistinction to the sealing of the areas with tannic acid or plaster of Paris. Active movement should be encouraged during the soak, the fingers should be dressed apart and the entire hand kept in the position of function. The aver-

age burn should be ready for grafting in three weeks, if tendons have not been exposed and frequently the single application of a split graft may be all that is necessary. If there has been an extensive deep burn, it is often advisable to 'dress' the wound with a thick split graft as soon as the sloughed tendons are separated and the granulations are clean, so that healing may stimulate activity and joint fixation may be limited, later thicker repair can be done.

In "dressing" the areas with a graft, there will be many that will regenerate the surface anyway, but the graft is put over the entire area for assurance that the raw areas are covered and it can later be cut away from the healed surfaces (5, 6) (Figs. 14, 15).

Neck Primary split graft repairs of open areas on the neck are seldom satisfactory in the end because of surface roughness, contracture and unsightliness. If the area is large and requires too much time for healing, split grafts may be used first to prevent too much deformity, and final correction can be made later (5, 6) (Fig. 13).

REPAIR OF SKIN LOSSES DUE TO SUBCUTANEOUS INFECTIONS

These losses may be very large and as soon as the cellulitis is controlled and the field and general condition is good enough for grafting, many of the areas can be permanently repaired with split grafts. In other cases early resurfacing will save much secondary contraction (Fig. 16).

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Axhausen, G.: Gunshot Wounds of the Jaw (*Die Kieferschussverletzungen*) *Med Welt*, 1937, p 1710

The treatment of mandibular fractures must remain in the hands of the dentist, for he alone is qualified to take care of the various details of their care. The exact adaptation of the fractured fragments is not of such great importance in other fractures, but in mandibular fractures it is necessary because of the demands of the act of mastication. The best method is to use a plaster mold for immobilization, but in the simpler fractures good results may be obtained by the use of splints. The splints are made from the plaster model. The fragments are brought into apposition either by wire ligatures, or by the use of elastic bands. In fractures of the lower jaw not involving the teeth, intermaxillary ligature is most advantageous. However, with the use of a splint, early opening of the mouth is possible, as redislocation will be prevented. In fractures of the upper jaw intra-oral and extra-oral apparatus must be employed, which are attached to a cap on the scalp. In the next war, the technique of immediate wound excision following dental prosthetic work should be carried out. This should be done in the field hospital where the first aid is given to the injured patient. The surgical care of the soft-part injury should also be carried out by the dentist, who today is sufficiently trained to accomplish this work. The dentist should, however, be under the jurisdiction of the surgeon, who must be called for the care of any arterial bleeding.

(FRANZ) WM C BECK, M D

Åkerman, N. The Treatment of Dislocated Fracture of the Zygomaticus (*Zur Behandlung dislozierter Zygomatikusfrakturen*) *Acta chirurg. Scand*, 1938, 80 359

The author describes a method worked out by Aleman at the Garrison Hospital in Stockholm, which has been used on 13 ambulatory patients with fracture of the zygomaticus during the past ten years without infection and with uniformly good results.

On the day before the corrective operation a plaster head splint (Fig 2), in which is embedded a steel wire from 15 to 20 cm long, extending out over the fracture region in derrick arm-like fashion, is applied. The next day, under general anesthesia, a small incision is made over the thickest part of the zygomaticus and a screw 5 cm by 1½ mm, with a conical threaded surface, is secured into a smooth-bore drill hole in the bone fragment. By using this screw as a purchase and controlling the position of the fragment with palpation of the dehiscence in the

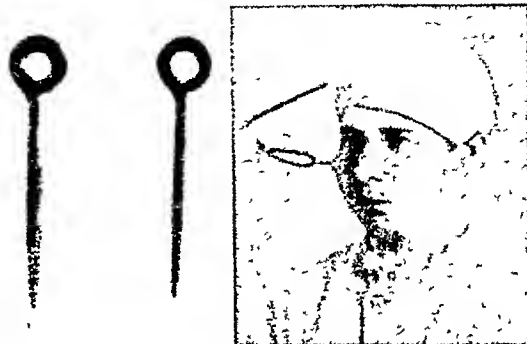


Fig 1 The type of screw used

Fig 2 The plaster head splint

orbital margin, correction is made and maintained for from ten to fourteen days by an elastic band from the loop at the end of the screw to the steel-wire arm. Overcorrection apparently need not be apprehended. For a few days following removal of the splint no solid substances should be chewed as they will cause pain.

JOHN W BRENNAN, M D

EYE

Stokes, W. H.: Retained Intra-Ocular Foreign Bodies: A Clinical Study, with a Review of 300 Cases. *Arch Ophth*, 1938, 19 205

In an effort to evaluate the present trends in the treatment of intra-ocular foreign bodies the literature was reviewed and the histories of 300 cases were analyzed. The study showed an amazing confusion in the methods of treatment, which depended mainly on personal preference, but showed a growing tendency toward conservatism.

The main difference of opinion is in regard to the route of extraction of a foreign body from the eye, and the obvious conclusion is that no one route can be used to the exclusion of any other. This study has also shown that the primary consideration may not be the route of extraction, but, rather, may be the question as to whether or not the foreign body should be removed at all. The employment of heroic measures for the removal of a foreign body has in many instances precipitated a tragedy instead of averted one, and it may be better judgment to allow the foreign body to remain in place. It is axiomatic that the removal of the foreign body does not insure the saving of the eye or of its vision, and the oculist is under the moral restraint not to aggravate the condition.

Subjective symptoms were not always in evidence and were not necessarily indicative of foreign body when present. Four per cent of the patients gave no history of injury and the diagnosis was established only on examination. Systematic complete examination is necessary for the correct diagnosis and should include the use of the corneal microcope and routine roentgenograms. The magnet should never be used until other methods are completed and the roentgenographic report is inconclusive. The foreign body was accurately localized with the x rays in 97.5 per cent of the 300 cases. In the remaining 2.5 per cent small foreign bodies were extracted with the magnet after the x ray reports were negative.

Of the 300 patients all but 6 were males, 60 per cent of whom were between the ages of twenty and forty. The majority were engaged in the usual industrial occupations. The right eye was injured in 133, the left in 162 and both in 5 patients. The anterior route was used for extraction in 140 cases, the posterior route in 39 cases and other methods were used in the remaining 121 cases. Among the 140 cases in which the foreign body was removed by the anterior route there were 67 cases in which the foreign body was in the anterior segment and 50 per cent of these patients retained good vision without correction. Only 9 per cent lost their vision permanently and completely on account of enucleation, severe uveitis or retinal detachment. The remainder were rendered industrially blind in the injured eye. There were 73 cases in which the foreign body was located in the posterior segment and its removal was effected through the anterior route. In this group only 13 per cent of the patients retained good vision and 50 per cent lost their vision completely and permanently. It is obvious from these figures that the anterior route is not best for removal of a foreign body located in the posterior segment of the globe.

There were 30 cases in which the foreign body was removed from the posterior segment through the posterior route and 40 per cent of these patients retained good vision without glasses while 33 per cent lost their vision entirely.

In 101 cases the foreign body was retained in the eye for from one month to thirty-five years. A detailed report of these cases is included. The most significant conclusion is that in many of these cases serious complications resulted from non-indicated extraction of the foreign body from eyes that had good visual acuity before the extraction. There was a total and permanent loss of vision in 60 cases in 21 of which enucleation was done, enucleation was advised in 3 other cases. Good vision was retained in 22 cases in 9 of which the foreign body was removed. The retention of a foreign body in the vitreous chamber always resulted in destruction of the vision. In no case did retention of a foreign body within the eye produce a sympathetic inflammation but after removal of the body inflammation occurred in 2 cases.

Enucleation was necessary in 67 or 22 per cent of the 300 cases. In 35 removal of the globe was necessary a few days after the accident because of panophthalmitis in all but 1 of these the foreign body being located in the vitreous chamber. The nature of the foreign body was apparently unrelated to the cause of the infection. In 22 cases violent uveitis followed the removal of the steel particle and in the majority of these cases the removal was months or years after the injury before which time the patient had a good cosmetic eye even though the vision might be poor. Not a single enucleation was done because of sympathetic inflammation contrary to the usual conception that retention of a foreign body will result in sympathetic ophthalmia. Sympathetic inflammation developed in a boy twelve years old three months after a slake of steel had been removed from the iris but with proper treatment he recovered vision of 20/30 in each eye.

Retinal detachment occurred in 41 cases in which the foreign body was located in the vitreous, and in 9 cases in which it was located in the retina. The most important causes of detachment were an inflammatory retraction of the vitreous, which produced bands of adhesions, retinal tears and post-retinal hemorrhages.

In 17 of the 300 cases the foreign body entered the cornea perforated the sclera and caused a double perforation. In 3 panophthalmitis required enucleation. In 4 there was useful vision of 20/50 or better four months after the accident. The other 10 were observed over a period of from one to eight years but all were rendered industrially blind by cataract or retinal detachment.

Of the foreign bodies of non-magnetic variety, there were 13 of copper, 5 of brass, 5 of lead, 4 of glass and 1 of stone. It was found that a foreign body could be retained in the anterior chamber for a number of years with perfect vision. When it was retained in the vitreous the eye was lost in all cases by uveitis or panophthalmitis. In all 5 cases in which the foreign body was brass enucleation was necessary. The same was true of lead glass and stone when the foreign body was in the vitreous. A foreign body lodged in the vitreous invariably produced disorganization of the structures of the globe, and even though there may have been little irritation for a considerable period iridocyclitis and loss of the eye were the final results. Foreign bodies lodged in the retina and sclera were tolerated about as well as those located in the anterior segment.

The postoperative care is of the utmost importance and it is difficult to impress the arachnoid laborer that adequate care is necessary. Absolute bed rest for a period of from ten to fourteen days after the removal of a foreign body from the posterior segment is imperative in every case. More recently electrocoagulating pins have been used in all cases of removal by the posterior route three or four pins being placed in position before the removal of the foreign body, with the same technique as in the operation for retinal detachment. Stokes believes

that detachment of the retina is reduced to a minimum by this precautionary procedure

Regarding enucleation of the eye, naturally many of the eyes are beyond hope from the beginning, but a review of these cases impressed Stokes with the number in which enucleation ultimately became necessary many weeks or months after the injury, but which presented actually serviceable eyes up to that time. The loss of earning ability and the resulting economic dependency following enucleation justify all efforts toward saving of the eye, or postponement of its removal. The results of this study show that conservative treatment is more often indicated than is recommended by the majority of writers

EDWARD S. PLATT, M.D.

Medvedef, N. I.: Double Perforations of the Eyeball: A Classification. *Arch Ophthalmol*, 1938, 19 224

There is no classification of double perforations of the eyeball in common use. The divergency of opinions as to the classification of these lesions hinders the analysis of the material being accumulated.

From 1920 to 1937, 37 patients with double perforation of the eyeball were treated at the Central Ukrainian Institute of Ophthalmology in Kharkov and at the clinic of the Donatz mining district (Donbass). Of these 19 came for treatment within the first ten days after the accident, and in only one case were orbital symptoms lacking. Forsmark, Ruebel and Wagenmann have noted the symptoms of recent double perforation. It is a well known fact that reaction of the orbit is the first and foremost symptom of recent double perforation. Edema of the eyelids and chemosis of the conjunctiva of the eyeball were the symptoms which most frequently accompanied retrobulbar localization of the object. Exophthalmos and impairment of the movements of the eyeball were noted in 10 patients. Fifteen of the 19 patients presented various degrees of orbital reaction without an infectious process as a cause for the edema. In 8 cases hemorrhages under the skin of the eyelids and the bulbar conjunctiva were noted. The localization of these hemorrhages is not directly connected with the anterior portion of the channel traversed by the injuring body.

Analysis of the cases shows that orbital symptoms appear not only when the foreign body is freely located in the orbital tissue, but also when the foreign body only partially protrudes into the orbit or when it has just perforated the posterior wall and still remains in the sclerotic. Such cases should therefore be regarded as cases of double perforation rather than of intra-ocular foreign bodies. Three groups of perforating lesions are therefore considered as double perforations (Fig 1).

In the first group, perforatio bulbi duplex completa, are placed those cases in which the injuring object is lying free in the orbit. The prognosis is better in this group than in the other two. Eight of the 10 patients have completely lost the vision of the injured eye, but 6 have retained good vision.

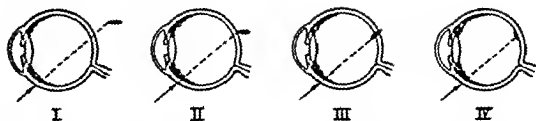


Fig 1—I, II and III illustrate double-perforating lesion through the eyeball. In I the intra-orbital splinter is outside the eyeball. In II the splinter is outside the eyeball but connected with the posterior course of the lesion. In III the splinter is jammed between the borders of the posterior course of the lesion. IV illustrates perforation of the eyeball by an intra-ocular foreign body, with no lesion through the posterior wall.

In the second group, perforatio bulbi duplex fere completa, are cases in which the foreign body is localized outside the eyeball but in connection with the wound of exit. Five of the 9 patients have become completely blind in the injured eye, while the others have retained only minimal vision.

In the third group, perforatio bulbi duplex cum inelatione, are the cases in which the foreign body is fixed in the wound of exit. Of the 9 patients with this injury 6 have completely lost the sight of the eye, the others have retained only minimal vision.

Analysis of clinical material according to this more precise classification will be of assistance in this important problem.

EDWARD S. PLATT, M.D.

Davidson, M.: Indirect Traumatic Optic Atrophies. *Am J Ophthalmol*, 1938, 21 7

Our knowledge of the cause of indirect traumatic optic atrophies dates from the middle of the last century, and particularly from the work of Berlin in 1878, which was based on necropsy observations of von Hoelder. The latter, by routine stripping of the dura of the anterior fossa, found 90 per cent of orbital-roof fractures and 73 per cent of optic-canal fractures in fractures of the base of the skull. Previously these cases of blindness were classified among the amblyopias and amauroses. Failure of ophthalmologists to recognize an interruption of optic-nerve continuity was the result of the strangeness of the concept of a condition now recognized as a descending atrophy of the optic nerve.

A review of cases reported in the literature shows that the most frequent type of accident was a fall from a height, which is also a factor in certain other primary causes, such as when the person is thrown from a car or motoreyele. The result of application of a blunt force to a skull unsupported at the other end is that of anteroposterior flattening of the skull and displacement of the brain, as distinguished from the crushing injury resulting from most automobile accidents, or the compound injury resulting from a missile, which are the major causes of traumatic ophthalmoplegias.

Students of the subject have generally accepted fracture of the canal as the cause of blindness following injuries to the head. The Barkans make the statement that x-ray examination has so far been of no value in the diagnosis of this condition; while

Subjective symptoms were not always in evidence and were not necessarily indicative of foreign body when present. Four per cent of the patients gave no history of injury and the diagnosis was established only on examination. Systematic complete examination is necessary for the correct diagnosis and should include the use of the corneal microscope and routine roentgenograms. The magnet should never be used until other methods are completed and the roentgenographic report is inconclusive. The foreign body was accurately localized with the x rays in 97.5 per cent of the 300 cases. In the remaining 2.5 per cent small foreign bodies were extracted with the magnet after the x ray reports were negative.

Of the 300 patients all but 6 were males, 60 per cent of whom were between the ages of twenty and forty. The majority were engaged in the usual industrial occupations. The right eye was injured in 133, the left in 161 and both in 5 patients. The anterior route was used for extraction in 140 cases, the posterior route in 39 cases and other methods were used in the remaining 121 cases. Among the 140 cases in which the foreign body was removed by the anterior route there were 67 cases in which the foreign body was in the anterior segment and 50 per cent of these patients retained good vision with out correction. Only 9 per cent lost their vision permanently and completely on account of enucleation, severe uveitis, or retinal detachment. The remainder were rendered industrially blind in the injured eye. There were 73 cases in which the foreign body was located in the posterior segment and its removal was effected through the anterior route. In this group only 13 per cent of the patients retained good vision and 50 per cent lost their vision completely and permanently. It is obvious from these figures that the anterior route is not best for removal of a foreign body located in the posterior segment of the globe.

There were 39 cases in which the foreign body was removed from the posterior segment through the posterior route and 49 per cent of these patients retained good vision without glasses while 33 per cent lost their vision entirely.

In 101 cases the foreign body was retained in the eye for from one month to thirty five years. A detailed report of these cases is included. The most significant conclusion is that in many of these cases serious complications resulted from non indicated extraction of the foreign body from eyes that had good visual acuity before the extraction. There was a total and permanent loss of vision in 60 cases in 21 of which enucleation was done, enucleation was advised in 3 other cases. Good vision was retained in 22 cases in 9 of which the foreign body was removed. The retention of a foreign body in the vitreous chamber always resulted in destruction of the vision. In no case did retention of a foreign body within the eye produce a sympathetic inflammation but after removal of the body inflammation occurred in 2 cases.

Enucleation was necessary in 67 or 22 per cent of the 300 cases. In 35 removal of the globe was necessary a few days after the accident because of panophthalmitis in all but 1 of these the foreign body being located in the vitreous chamber. The nature of the foreign body was apparently unrelated to the cause of the infection. In 22 cases violent uveitis followed the removal of the steel particle and in the majority of these cases the removal was months or years after the injury before which time the patient had a good cosmetic eye even though the vision might be poor. Not a single enucleation was done because of sympathetic inflammation contrary to the usual conception that retention of a foreign body will result in sympathetic ophthalmia. Sympathetic inflammation developed in a boy twelve years old three months after a flake of steel had been removed from the iris but with proper treatment he recovered vision of 20/20 in each eye.

Retinal detachment occurred in 41 cases in which the foreign body was located in the vitreous and in 9 cases in which it was located in the retina. The most important causes of detachment were an inflammatory retraction of the vitreous which produced bands of adhesions, retinal tears and post retinal hemorrhages.

In 17 of the 300 cases the foreign body entered the cornea perforated the sclera and caused a double perforation. In 3 panophthalmitis required enucleation. In 4 there was useful vision of 20/30 or better four months after the accident. The other 10 were observed over a period of from one to eight years but all were rendered industrially blind by cataract or retinal detachment.

Of the foreign bodies of non magnetic variety, there were 13 of copper, 3 of brass, 5 of lead, 2 of glass and 1 of stone. It was found that a foreign body could be retained in the anterior chamber for a number of years with perfect vision. When it was retained in the vitreous the eye was lost in all cases by uveitis or panophthalmitis. In all 5 cases in which the foreign body was brass enucleation was necessary. The same was true of lead, glass and stone when the foreign body was in the vitreous. A foreign body lodged in the vitreous invariably produced disorganization of the structures of the globe and even though there may have been little irritation for a considerable period iridocyclitis and loss of the eye were the final results. Foreign bodies lodged in the retina and sclera were tolerated about as well as those located in the anterior segment.

The postoperative care is of the utmost importance and it is difficult to impress the average laborer that adequate care is necessary. Absolute bed rest for a period of from ten to fourteen days after the removal of a foreign body from the posterior segment is imperative in every case. More recently electro-coagulating pins have been used in all cases of removal by the posterior route, three or four pins being placed in position before the removal of the foreign body with the same technique as in the operation for retinal detachment. Stokes believes

that detachment of the retina is reduced to a minimum by this precautionary procedure

Regarding enucleation of the eye, naturally many of the eyes are beyond hope from the beginning, but a review of these cases impressed Stokes with the number in which enucleation ultimately became necessary many weeks or months after the injury, but which presented actually serviceable eyes up to that time. The loss of earning ability and the resulting economic dependency following enucleation justify all efforts toward saving of the eye, or postponement of its removal. The results of this study show that conservative treatment is more often indicated than is recommended by the majority of writers

EDWARD S PLATT, M D

Medvedef, N. I : Double Perforations of the Eyeball. A Classification. *Arch Ophth*, 1938, 19 224

There is no classification of double perforations of the eyeball in common use. The divergency of opinions as to the classification of these lesions hinders the analysis of the material being accumulated

From 1929 to 1937, 37 patients with double perforation of the eyeball were treated at the Central Ukrainian Institute of Ophthalmology in Kharkov and at the clinic of the Donatz mining district (Donbass). Of these 19 came for treatment within the first ten days after the accident, and in only one case were orbital symptoms lacking. Forsmark, Ruebel and Wagenmann have noted the symptoms of recent double perforation. It is a well known fact that reaction of the orbit is the first and foremost symptom of recent double perforation. Edema of the eyelids and chemosis of the conjunctiva of the eyeball were the symptoms which most frequently accompanied retrobulbar localization of the object. Exophthalmos and impairment of the movements of the eyeball were noted in 10 patients. Fifteen of the 19 patients presented various degrees of orbital reaction without an infectious process as a cause for the edema. In 8 cases hemorrhages under the skin of the eyelids and the bulbar conjunctiva were noted. The localization of these hemorrhages is not directly connected with the anterior portion of the channel traversed by the injuring body.

Analysis of the cases shows that orbital symptoms appear not only when the foreign body is freely located in the orbital tissue, but also when the foreign body only partially protrudes into the orbit or when it has just perforated the posterior wall and still remains in the sclerotic. Such cases should therefore be regarded as cases of double perforation rather than of intra-ocular foreign bodies. Three groups of perforating lesions are therefore considered as double perforations (Fig 1)

In the first group, perforatio bulbi duplex completa, are placed those cases in which the injuring object is lying free in the orbit. The prognosis is better in this group than in the other two. Eight of the 10 patients have completely lost the vision of the injured eye, but 6 have retained good vision.

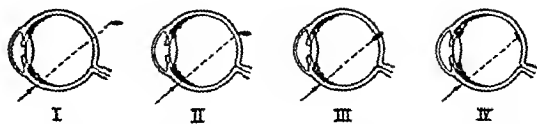


Fig 1—I, II and III illustrate double-perforating lesion through the eyeball. In I the intra-orbital splinter is outside the eyeball. In II the splinter is outside the eyeball but connected with the posterior course of the lesion. In III the splinter is jammed between the borders of the posterior course of the lesion. IV illustrates perforation of the eyeball by an intra-ocular foreign body, with no lesion through the posterior wall

In the second group, perforatio bulbi duplex fere completa, are cases in which the foreign body is localized outside the eyeball but in connection with the wound of exit. Five of the 9 patients have become completely blind in the injured eye, while the others have retained only minimal vision.

In the third group, perforatio bulbi duplex cum inelatione, are the cases in which the foreign body is fixed in the wound of exit. Of the 9 patients with this injury 6 have completely lost the sight of the eye, the others have retained only minimal vision.

Analysis of clinical material according to this more precise classification will be of assistance in this important problem

EDWARD S PLATT, M D

Davidson, M : Indirect Traumatic Optic Atrophies.

Am J Ophth, 1938, 21 7

Our knowledge of the cause of indirect traumatic optic atrophies dates from the middle of the last century, and particularly from the work of Berlin in 1878, which was based on necropsy observations of von Hoelder. The latter, by routine stripping of the dura of the anterior fossa, found 90 per cent of orbital-roof fractures and 73 per cent of optic-canal fractures in fractures of the base of the skull. Previously these cases of blindness were classified among the amblyopias and amauroses. Failure of ophthalmologists to recognize an interruption of optic-nerve continuity was the result of the strangeness of the concept of a condition now recognized as a descending atrophy of the optic nerve.

A review of cases reported in the literature shows that the most frequent type of accident was a fall from a height, which is also a factor in certain other primary causes, such as when the person is thrown from a car or motorcycle. The result of application of a blunt force to a skull unsupported at the other end is that of anteroposterior flattening of the skull and displacement of the brain, as distinguished from the crushing injury resulting from most automobile accidents, or the compound injury resulting from a missile, which are the major causes of traumatic ophthalmoplegias.

Students of the subject have generally accepted fracture of the canal as the cause of blindness following injuries to the head. The Barkans make the statement that x-ray examination has so far been of no value in the diagnosis of this condition; while

Rollet Paufigue and Levy find x ray examinations valuable if made before the fissures fill up. They report involvement of the upper and lower outer canal wall in 10 cases. Wuerdemann states that the upper nasal orbital wall is the most common site of fissures. Two cases have been reported recently in which callus formation was found at operation. In neither case has there been any improvement. Only one positive x ray diagnosis of narrowing of the foramen was made in the series reported here.

Hemorrhages into the sheath of the optic nerve have been considered the cause in some cases of optic atrophy, namely in cases with partial atrophy and partial recovery of vision. Favory and Terrien believe that hemorrhage into the sheath occurs more often than is generally believed. Favory states that this can be diagnosed only when bloody spinal fluid is found. The characteristic findings are retinal hemorrhages, sometimes papillitis which is seen from one to three weeks after injury and the abolition of the direct light reflex. Favory states that recovery of vision is general in spite of atrophy that the mydriasis persists and that there is often a pigmentation around the papilla as a sequel.

A third mechanism has been described by Coppez as the cause of the syndrome, an anteroposterior compression of the skull which widens the distance between the optic foramina to which the optic nerves are adherent and results in a split of the chiasm or a tearing of the optic nerve or tract from the chiasm. Malbran believes that the backward displacement of the brain detaches the chiasm from one or both optic nerves.

Numerous attempts to find characteristic bundle defects in the fields have been made but the probability is that the lesions are too diffuse both in the optic nerves and in the chiasm to show well defined bundle involvement. Inasmuch as the visual impairment runs to about 75 or 80 per cent in the majority of cases, visual field studies are possible in only a few of the cases.

A review of 42 cases of indirect optic atrophy following injury of the head which were encountered among 20,000 claimants examined for compensation for eye injuries, was made in an attempt to clarify the medicolegal status of such injuries. The author believes that early fundus examination after a head injury no matter how slight the injury may seem to be would remove much of the conflict of opinion. More desirable yet would be the routine pre-employment and periodic eye examination by ophthalmologists. Justification for such care is found in the high cost of the relatively few severe cases of eye injuries.

Certain issues have frequently been the basis of controversies in relation to optic atrophies. One is the interval normally occurring between the injury and the optic atrophy. A variety of opinions have been expressed and the consensus of these leads to the conclusion that an interval of six days does not necessarily argue for the preexistence of the atrophy while an optic atrophy appearing within three

months is reasonably attributable to the injury. After three months we may be dealing with a slowly developing chronic arachnoiditis due to a head injury, late intracranial hemorrhages and abscesses resulting from a craniocerebral injury.

Another source of discussion involves the demonstration of basal fracture with x rays. It is well known that severe injury to the brain may occur without skull fracture and also that basal fractures are often not detected with x rays. It is therefore not possible to base the degree of disability upon the x ray findings alone in head injuries.

The third issue regards the question of unconsciousness, which is probably a more reliable index than the demonstration of a skull fracture. There are however several cases reported in which optic atrophy occurred without loss of consciousness. Two such cases in the author's series occurred without unconsciousness or loss of time.

Another difficulty is encountered in evaluating the cases which present the chiasmal syndrome or bilateral optic atrophy. Bilaterality *a priori* creates an adverse judgment unless the relationship to the injury is obvious. The optic atrophy following injury are so predominantly unilateral that there is justification for hesitancy whereas in multiple sclerosis, vascular lesions, tubercular meningitis, sinusitis, and regional neoplasms (hypophyseal, suprasellar, frontal lobe, optic nerve and chiasm) are predominantly responsible for bilateral atrophies. Wagenmann reported both primary and secondary bilateral traumatic atrophies. For the primary type he assumed a bilateral fracture of the sella or compression by a basal hemorrhage, with a sudden onset of symptoms. For the secondary atrophies which appear late and develop slowly, he considered secondary intracranial hypertension, cerebral meningel vascular and osseous processes, scar formation and callus. They are initiated by papillitis rarely by choking and more rarely by retinal involvement. He thought the injury must be rather severe. In addition the possibility of aggravating an existing lues or tabes, neoplasm, multiple sclerosis, tuberculosis or sinusitis must be considered.

Cantonnet found bilateral involvement of the optic nerve in 7 1/2 per cent of 223 cases of optic nerve lesions with basal fractures. In the series presented here 12 per cent of the cases were bilateral with partial atrophy in one eye and total atrophy in the other. The majority of Cantonnet's cases of bilateral atrophy terminated in partial recovery, complete recovery occurred in 2 per cent.

In Cantonnet's series 4 per cent of the unilateral optic atrophies were contralateral while the author's series showed 7 1/2 per cent of the cases to be contralateral. There was one apex syndrome with involvement of the optic and sphenoidal foramina.

The possibility of latent non-traumatic intracranial conditions must be considered even with short intervals between injury and atrophy, but the greatest difficulty occurs with bilateral involvement occurring after a long interval. Errors in diagnosis

are decreased by the policy of observing the difficult cases for as long as three years in order to rule out non-traumatic, sole, or contributing causes. It is essential that early examination of the eyes be made, regardless of the mildness of the head injury, so that many reasons for controversy may be eliminated.

EDWARD S. PLATT, M.D.

Arruga, H.: The Surgical Treatment of Lacrimation. *Arch. Ophth.*, 1938, 19 9

Lacrimation is an irregular symptom which may yield to a single probing, or it may not be relieved after a long course of treatment. The prognosis is therefore difficult, and is not greatly aided by procedures other than irrigation and probing. Latent processes may develop without manifestation until obstruction is complete.

It is advisable, in cases of simple lacrimation, to attempt a prudent exploration, together with irrigations of physiological salt solution or a very mild antiseptic solution. Examination and treatment by a rhinologist is also indicated. If this simple treatment does not give satisfactory results within a few days, a probe may be passed into the sac, and followed by irrigation. If the fluid passes more easily than before the probing, the effect of the treatment should be observed. Should the patient still complain of lacrimation, the same treatment is repeated. If, after probing into the sac, fluid still passes with difficulty, a probe is passed through the sac into the nasolacrimal duct, and irrigation is again attempted. If fluid passes easily, the treatment is repeated every three or four days until relief is obtained. Should these measures fail to produce satisfactory results, complete probing into the nose must be employed, with care to adapt the form of the probe to the anatomical position of the nasolacrimal duct. Too straight a probe may result in the tearing of the mucosa of the duct.

If, after several probings, a cure is not obtained, surgical methods must be used. In the presence of suppuration, repeated probings and irrigations will diminish the amount of infection, but it is unlikely that such treatment will result in cure.

Congenital lacrimal obstruction in the newborn requires complete probing, since the obstruction is at the nasal opening of the duct.

With reference to operative procedures, the author states that stricturotomy sometimes gives good results, but the results are slower and less certain than those obtained from other procedures, and the canaliculus is left too widely open. Extirpation of the lacrimal gland results in excessive dryness of the eye. Obstruction of the excretory ducts of the gland by cauterization, electrolysis, or diathermic punctures is not advisable.

Extirpation of the lacrimal sac is the operation most frequently performed, as it is the easiest and most rapid procedure. However, it leaves a definite lacrimation which is very annoying to some people. Other persons who ask only for relief from the ocular irritation, and who are not interested in a more pains-

taking operation, may be entirely satisfied with the simple removal of the sac. In the cases of patients with cataract, some ophthalmologists consider the security against infection greater after extirpation than after dacryocystorhinostomy. Arruga has operated for 30 cataracts in patients who have had dacryocystorhinostomy, without any complicating infection.

The real progress in the treatment of lacrimation resulting from obstruction in the nasolacrimal duct is due to the operation which replaces the duct by an opening through the nasal wall. This operation was first performed by Toti. Perfection of the technique has developed the joining of the nasal to the lacrimal mucosa by suturing the two membranes.

Pre-operative preparation of the patient may include the use of a barbiturate or a narcotic. If the patient is a hemophiliac, calcium chloride is given for two days previously, and before the operation an injection of 1 gm. of the same drug is given, together with a coagulant.

Local anesthesia is nearly always sufficient, but some operators prefer to anesthetize their patients with tribromethanol, or large doses of hypnotics. Three cubic centimeters of a 2 per cent solution of procaine with from 10 to 12 drops of epinephrin are injected with a blunt needle introduced into the upper inner angle of the orbit to a depth of 2 cm., in order to reach the region of the anterior ethmoid foramen. One cubic centimeter of the solution is injected here, the needle is withdrawn somewhat, and a few drops are injected under the skin. The needle is then passed internally into the bone, where 0.5 c.cm. of the solution is injected. The needle is withdrawn and external pressure is applied to displace a part of the fluid toward the inferior lacrimal region. Another puncture is made at the angle of the inferior and inner walls of the orbit, where 1 c.cm. of solution is injected. Anesthesia of the nasal mucosa is obtained by the injection of equal parts of a 4 per cent cocaine solution and a 1 to 1,000 solution of epinephrin.

Incision is made as for extirpation of the sac. The internal canthal ligament is dissected to its bony attachment and is detached from the bone with a rasp. The sac is separated from the bone.

Perforation of the bone is performed with a mallet and chisel, or by a trephine and bur, the latter method requiring more care but being more agreeable to both patient and physician. Great care should be taken to expose the mucosa without wounding it. The bony opening is enlarged by the use of a bur, the most convenient bur being Gutzeit's, which permits enlargement of the opening while the mucosa is protected. The opening should be beveled on the nasal side.

If the mucosa has been wounded, the procedure must be modified to secure the best possible flap of mucosa by enlarging the bony opening as indicated.

When the nasal mucosa is ready, the lacrimal sac is cut vertically, the posterior flap is approximated to the nasal mucosa, and an incision parallel to the

incision of the sac is made in the mucosa. The two posterior flaps are sutured with No. 0 or No. 00 silk. From 2 to 4 sutures are placed in the posterior flaps and a similar number in the anterior flaps. It is necessary to remove the retractor before an attempt is made to tie the anterior sutures.

The external suture may be made in the usual manner. An ointment should be applied to the region of the operation to prevent sticking of the dressing and the dressing applied with adhesive tape for pressure. A cotton pledget is inserted in the nostril, changed when necessary, and removed during sleep. It is usually not needed the second day. Hemorrhage is rare, but in the event that it occurs, gauze which has been soaked in petrolatum is packed into the nose. The hemorrhage is stopped by the pressure of the gauze or cotton, which may be removed after two days.

Patients need not be hospitalized, but the dressing must be changed every day. Prudent irrigations of the sac with physiological salt solution should be made.

The percentage of cures is 95 or more. In certain cases an obstruction of the opening may occur during the first few weeks after operation. In such cases it is necessary to perforate the membrane which closes the opening. Anesthetization of the nasal mucosa is performed as before, and cocaine and epinephrin solution are injected into the sac. The lower canaliculus is dilated until a No. 5 probe passes, which is left in place for several minutes, then a Weber knife is passed by the same route and an incision through the membrane is made. In most cases this results in a permanent opening.

When the lacrimal sac has previously been removed, dacryocystorrhinostomy is successful in from two-thirds to three-fourths of the patients. Integrity of the inferior canaliculus is indispensable for the operation. Thin bone and small ethmoid cells are a favor to a good result.

In this procedure the largest possible opening in the bone is necessary. A probe is passed through the inferior canaliculus and an incision is made over the tip of the probe. The incision is prolonged inward and downward deeply into the scar tissue and a wound with anterior and posterior flaps corresponding to those in the regular operation is obtained in this manner.

Postoperative treatment consists of daily irrigation after previous probing is performed. In general no difficulties occur. TOWARD S. PLATT, M.D.

Hope Robertson, W. The Surgical Treatment of Detachment of the Retina. *Australian & New Zealand J. Surg.* 1935 7: 236.

The author states that some of the factors which influence the success of operation for detachment of the retina are:

1. The duration of the detachment. It has been the author's experience that the sooner a patient with a detachment is operated on, the better is the chance of a successful result.

2. The extent of the detachment. The greater the detachment is, the less the chance of a successful issue.

3. The position of the detachment. Detachments in the inferior part of the retina react much more satisfactorily to operation than those in the superior part of the retina.

4. The area of the pigment. Detachments which are limited by an area of pigment, which really looks like the line of a choroiditis, seem to have a particularly good prognosis.

5. The holes in the retina. The author states that he has not as yet operated on a sufficient number of patients to be able to give any very definite opinion on the effect of the position, size, shape, and number of holes in regard to the ultimate prognosis following operation. He says he can find a hole in at least 60 per cent of his own cases. He does not wish to mislead anyone into thinking that he disregards the hole altogether, but believes he can mark it out nearly enough by just using an ophthalmoscope. He believes that the very large ragged hole offers the worst case for operation.

6. The involvement of the macula. Involvement of the macula has no effect whatsoever upon the ease or success of reattachment of the retina by operation. However, it has a very great effect upon the prognosis so far as ultimate central vision is concerned.

The age of the patient has very little to do with estimating the chances of success or failure of operation.

CHOICE OF OPERATION

Safar's technique, which was used in 5 cases, was 100 per cent successful. Gonin's technique, which was used in 6 cases, gave no improvement at all.

The author does not give a description of Safar's technique, but he lays stress on what appear to him to be some of the important points in the operation.

1. Repeated ophthalmoscopic examinations must be carried out to familiarize the surgeon with the position of the detachment and the hole or holes.

2. There must always be a good exposure of the area to be operated on.

3. The use of a pair of dividers, as used in school, plus a very small metal rule is a very easy method of ensuring that at no time will the diathermy points approach nearer than 0.5 mm. to the limbus.

4. The ideal of Safar's operation is to encircle the region of the maximum detachment and hole with a series of diathermy points to get all the electrodes in position and not to remove any until the last is in place.

5. In using Safar's electrodes the surgeon must always remember to keep a slight pressure on them as he switches on the current.

6. Before the electrodes are applied to the sclera it is essential to have the sclera dry and clean.

After the operation both eyes must be firmly bandaged for at least from two to three weeks. A patient with an inferior detachment should be nursed in Fowler's position or a strictly recumbent position. In a superior detachment the foot of the bed should

be raised. When the patient has a temporal detachment he should lie on the same side of the face. The fundus should not be examined until the sixth day. If the retina is not completely back in place on the sixth day, no further rest will reattach it. When the recumbent position is used the patient should be given a pillow at the beginning of the third week and the height of the pillow gradually increased until the beginning of the fourth week when he may sit up. Toward the end of the fourth week he is allowed out of bed. The patient must be instructed that no heavy lifting or strenuous exercise is to be undertaken until six months after the operation.

As to the end-results, it may take some months before a full field can be obtained with a 1-5 mm test object, and in certain cases a full field with a test object as small as 1-5 mm may never be obtained. It seems as if the retina loses some of its power of finer differentiation during its detachment.

Most cases of detachment of the retina progress until the retina becomes almost completely detached, so, even though a reattached retina does not completely return to its normal functioning power, operation at least prevents the rest of the normally functioning retina, and the macula in a great number of cases, from becoming detached also.

LESLIE L. MCCOY, M D

Gifford, S. R.: *Physical Therapy in Ophthalmological Practice. Arch Ophthalmol*, 1938, 19 171

Local phototherapy is useless in any deeply situated inflammation, though it is probably of value in superficial keratitis, particularly in herpetic keratitis.

X-ray therapy is indicated in blepharitis, dendritic and superficial punctate keratitis, and, possibly, in disciform keratitis.

The best method of applying ordinary heat to the eye is by means of the infra-red lamp. The application of cold following operation, especially after an operation for squint, markedly reduces or eliminates the reaction.

Local short-wave diathermy may prove very valuable in the treatment of chronic uveitis, although the dosage has not yet been standardized.

General fever therapy is valuable in gonorrheal ophthalmia, luetic atrophy of the optic nerve, and interstitial keratitis.

SAMUEL A. DURR, M D

NOSE AND SINUSES

Spencer, F. R., and Black, W. C.: *Malignant Disease of the Nasal Accessory Sinuses, with a Review of 11 Cases. Laryngoscope*, 1938, 48 77

The authors present 11 cases of malignant tumors involving the nasal accessory sinuses, 10 of which occurred in the male and 1 in the female. The ages ranged from twenty-eight to sixty-eight years, the average age being fifty-two. In 7 of the patients, the maxilla first became involved, there was extension to the orbit in 6 patients, and to the hard palate in 5 patients. In no patient was there evidence of metastases.

The predominating tumor is usually of the squamous-cell type, but in the authors' series there was one transitional-cell carcinoma, one neurosarcoma, and one plasma cytoma.

The milder early symptoms do not attract the patient's attention, but a late diagnosis means a poor prognosis, since these tumors often invade the more important structures, such as the meninges, brain, and orbit.

In conclusion the authors state that earlier diagnosis, especially for intelligent private patients, early removal of the tumor by surgical diathermy (preceded on the operating table by a biopsy), and the use of the cautery, radium, and the roentgen ray have all helped to save human lives. Surgical removal of the superior maxilla is now rarely done. The death rate from this procedure in the hands of our best otolaryngologists has been quite high. Subsequent observation for any recurrence, with proper treatment of the growth, has also improved the results.

JOHN F. DELPE, M D.



incision of the sac is made in the mucosa. The two posterior flaps are sutured with No. 0 or No. 00 silk. From 2 to 4 sutures are placed in the posterior flaps and a similar number in the anterior flaps. It is necessary to remove the retractor before an attempt is made to tie the anterior sutures.

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Patients need not be hospitalized but the dressing must be changed every day. Prudent irrigations of the sac with physiological salt solution should be made.

The percentage of cures is 95 or more. In certain cases, an obstruction of the opening may occur during the first few weeks after operation. In such cases it is necessary to perforate the membrane which closes the opening. Anesthetization of the nasal mucosa is performed as before and cocaine and epinephrin solution are injected into the sac. The lower canaliculus is dilated until a No. 5 probe passes which is left in place for several minutes, then a Weber knife is passed by the same route and an incision through the membrane is made. In most cases this results in a permanent opening.

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3 The position of the detachment. Detachments in the inferior part of the retina react much more satisfactorily to operation than those in the superior part of the retina.

4 The area of the pigment. Detachments which are limited by an area of pigment which really looks like the line of a choroiditis seem to have a particularly good prognosis.

5 The holes in the retina. The author states that he has not as yet operated on a sufficient number of patients to be able to give any very definite opinion on the effect of the position, size, shape, and number of holes in regard to the ultimate prognosis following operation. He says he can find a hole in at least 90 per cent of his own cases. He does not wish to mislead anyone into thinking that he disregards the hole altogether but believes he can mark it out nearly enough by just using an ophthalmoscope. He believes that the very large ragged hole offers the worst case for operation.

6 The involvement of the macula. Involvement of the macula has no effect whatsoever upon the ease or success of reattachment of the retina by operation. However, it has a very great effect upon the prognosis so far as ultimate central vision is concerned.

The age of the patient has very little to do with estimating the chances of success or failure of operation.

CHOICE OF OPERATION

Safar's technique which was used in 5 cases was 100 per cent successful. Gonin's technique, which was used in 6 cases, gave no improvement at all.

The author does not give a description of Safar's technique, but he lays stress on what appear to him to be some of the important points in the operation.

1 Repeated ophthalmoscopic examinations must be carried out to familiarize the surgeon with the position of the detachment and the hole or holes.

2 There must always be a good exposure of the area to be operated on.

3 The use of a pair of dividers as used in school plus a very small metal rule is a very easy method of ensuring that at no time will the diathermy points approach nearer than 9 mm. to the limbus.

4 The ideal of Safar's operation is to encircle the region of the maximum detachment and hole with a series of diathermy points to get all the electrodes in position and not to remove any until the last is in place.

5 In using Safar's electrodes the surgeon must always remember to keep a slight pressure on them as he switches on the current.

6 Before the electrodes are applied to the sclera it is essential to have the sclera dry and clean.

After the operation both eyes must be firmly bandaged for at least from two to three weeks. A patient with an inferior detachment should be nursed in Fowler's position or a strictly recumbent position. In a superior detachment the foot of the bed should

1 to 3 cm from the surface. Marsupialization consists of finding where the abscess comes nearest the surface by exploring with a blunt ventricular needle through one or more burr holes, then enlarging the bony opening, sucking out part of the abscess contents, and, finally, stitching the capsule to the galea aponeurotica. A gutta-percha gauze drain is placed in the cavity. Repeated tapping is another method of procedure which was used in 4 of the 18 cases of encapsulated abscess, one cerebellar abscess required only a single tapping. In the abscesses that were tapped, the organism was obtained from smears, but no growth could be obtained by culture. The method is excellent in suitably selected cases but is not generally satisfactory. Extirpation of an abscess is splendid if it can be carried out, but in the author's hands marsupialization of the abscess was just as effective as extirpation. It is to be noted that in at least one case ventriculography was done, the abscess contained from 60 to 70 c cm of pus, and was brought to a successful conclusion.

The author believes that, when possible, marsupialization is the treatment of choice, and that in chronic encapsulated abscess the mortality rate ought not to exceed from 10 to 20 per cent. In the author's series of 17 patients with well-encapsulated abscesses, there were 2 deaths, a mortality rate of 11.7 per cent.

ADRIEN VERBRUGGEN, M D

Globus, J. H.: Glioneuroma and Spongioneuroblastoma, Forms of Primary Neuro-Ectodermal Tumors of the Brain. *Am J Cancer*, 1938, 32 163

Though it is apparently the general impression among neuropathologists that primary cerebral neoplasms of neuro-ectodermal derivation are rare, Globus points out the fact that in a group of 178 verified supratentorial gligenous neoplasms observed at the Mount Sinai Hospital (New York), there were 12 cases of ganglioneuroma and 10 instances of spongioneuroblastoma. In Cushing's series of 862 verified gligenous tumors, there was but 1 supratentorial ganglioneuroma. Obviously, he believes, the failure to recognize their identifying characteristics, which may in part be due to the lack of use of the very valuable Nissl stain, accounts for their supposed rarity.

The ganglioneuromas and spongioblastomas have each very definite clinical, gross anatomical, and histological characteristics. Patients harboring a ganglioneuroma most frequently suffer a precipitous onset of symptoms, frequent epileptiform seizures of one type or another, abrupt deterioration of intellect, and change in behavior. The clinical course is fairly rapid but often with temporary remissions, and meager localizing findings. These tumors are most often poorly delineated from the normal brain tissue, the containing hemisphere is enlarged, the tumor has a firm, smooth, mucinous surface, and it may contain mucinous cysts. Histologically, the tumors are characterized by a striking uniformity in cellular content and arrangement. There are large numbers of fairly well differentiated nerve cells which

have small cell bodies, a restricted amount of Nissl substance, and a scanty number of cell processes. The glial elements also are small in number, and they resemble the glial pattern of a young brain. The cellular components of this tumor are more mature than those of the spongioneuroblastoma, and there is a characteristic uniformity in the histological picture.

Whereas the ganglioneuroma may be considered to be of a low-grade malignancy, the spongioneuroblastoma is definitely more primitive in cell type and therefore more malignant. Clinically, these tumors are often manifested by an abrupt onset with frequent convulsive seizures, but the progression of symptoms is unbroken and more rapid than in the case of ganglioneuromas. Since in the spongioneuroblastoma there may be disseminated lesions throughout the brain, as well as one large neoplastic mass, the clinical signs may be confusing and overlapping. These tumors are generally found located deep in the hemisphere, particularly in the striothalamic angle. They are friable and granular and easily distinguished from the adjacent brain tissue. In many respects, both grossly and histologically, these tumors resemble tuberous sclerosis. Neuroblasts and spongioblasts occur in all stages of differentiation and malformation, and in varying numbers. They tend to arrange themselves in nest-like masses. The presence of both spongioblastic and neuroblastic derivatives in these tumors lends support to the Conheim embryonal-rest theory of tumor formation.

This article contains a detailed clinical case history and autopsy report for each of the 22 cases of these types of tumors observed to date by Globus.

JOHN MARTIN, M D

Glaser, M. A., and Beerman, H. M.: Atypical Facial Neuralgia. An Analysis of 200 Cases. *Arch Int Med*, 1938, 61 172

This article is a comprehensive analysis of a large group of cases of atypical facial pain first described by Sluder. One hundred and forty-three of these cases of facial neuralgia have been previously reported by Glaser.

The pain is rather constant, and this distinguishes it from the intermittent, paroxysmal attacks of trigeminal neuralgia, from which it must be differentiated. Females are affected more often than males, in the proportion of 3 to 1. The pain is usually felt in the area supplied by the facial artery, the external maxillary artery. The pain is variously described by patients, but it is deep seated and of a burning or throbbing character. Sympathetic phenomena are present in 50 per cent of the cases, these take the form of lacrimation, edema, corneal injection, and other conditions.

Atypical facial neuralgia must be differentiated from trigeminal neuralgia, glossopharyngeal neuralgia, and superior laryngeal neuralgia, all of which are paroxysmal in character.

The bibliography is excellent.

ADRIEN VERBRUGGEN, M D

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Carrillo R. Iodoventriculography of the Posterior Fossa (Iodoventriculographia fossa posterior)
Bol inst de clin quir Univ de Buenos Aires
1938 74

This report is an exhaustive 633 page monograph dealing with the statistics of diagnosis and treatment of 550 cases of intracranial lesions in which pre operative diagnosis was aided by means of the intraventricular injection of iodized oil and subsequent x ray study. The discussion has particularly to do with the posterior fossa.

Carrillo reiterates at some length the reasons for the various difficulties in the diagnosis of lesions of the posterior fossa and emphasizes the fact which all neurologists know, namely, that symptoms of the posterior fossa may be masked or manifested in many different ways and with a disconcerting confusion of findings. He points out the fact that of all intracranial lesions those of the posterior fossa are most commonly misdiagnosed by ordinary clinical means or even by the use of air ventriculography. The use of iodized oil in ventriculography (the author prefers oil to thorotrast) was begun in the Republic of Argentina in 1928 and its popularity has constantly increased because of the good results which have been obtained. The diagnoses by this method of lesions of the posterior fossa and lesions of the brain stem, aqueduct and third ventricle have been 98 per cent accurate. No deaths or untoward postoperation complications have been encountered which could be said to have been caused by the injected oil and the author has found no striking changes in the meninges, choroid or ependyma which would contra indicate the use of iodized oil.

After reviewing the usual clinical syndromes of lesions of the posterior fossa and emphasizing their inadequacy for diagnosis the author presents the arguments for and against the use of air and thorotrast and then explains in detail the technique of the use of iodized oil in ventriculography. The procedure is indeed a simple one. With the patient in a ventral position 2 burr holes are made over the occiput through small incisions in the skin. Cannulas are passed into the posterior horns of the ventricles the intraventricular pressures are measured and a ventricular estimation is made according to the method of Dandy. From 25 to 30 c cm of cerebrospinal fluid are withdrawn and 4 c cm of iodized oil are then injected and allowed to settle out in the anterior horns. In the event that the brain is hydrocephalic air is injected in addition to the oil in an amount up to a third or half of the amount of fluid withdrawn. The scalp incisions are closed and the head is x rayed in as many intraventricular positions as may be necessary for diagnosis.

In about 450 pages of text and with many excellent and graphic photographs, drawings and charts the accuracy of this diagnostic procedure is effectively expressed in a manner which leaves no doubt as to the author's enthusiasm for his subject. Normal and pathological images are presented side by side in single or series studies, and the fact is stressed that the roentgenograms are indisputable anatomical proof of the existence of the lesion in question and that in many cases in which the x ray evidence was unmistakable the clinical signs were inconclusive. Cases are illustrated of various types of tumors of the third ventricle, pons, aqueduct, pineal gland, choroid plexus, corpora quadrigemina, cerebellum, pontine angle, fourth ventricle, all parts of the cerebellum and the medulla as well as of arachnoiditis of the aqueduct, fourth ventricle and cul de sac. By such accurate localization the members of the neurological surgery staff at the University of Buenos Aires have found that in many cases a partial sub-occipital craniectomy suffices whereas formerly a complete removal of the bone had been necessary and in view of the high mortality of operations on the posterior fossa they welcome any means which will minimize the extent of the operation.

This bulletin contains an unusually good collection of roentgenograms following the use of iodized oil for ventriculography of the posterior fossa and they alone present a comprehensive anatomicopathological study of the ventricles. JONV MARRY MD

Horrax G. Brain Abscess. Brit J Surg 1935 21
538

This article is an amplification of a paper read at the joint meeting of the British and American Societies of Neurological Surgery in London, in July 1935. Thirty cases of brain abscess are reviewed, and these comprise the author's experience with this condition over a period of nine years. Many of the patients were operated on in Cushing's clinic at the Peter Bent Brigham Hospital, Boston.

The brain abscesses are divided into two groups: acute and multiple, often metastatic abscesses usually having serious pulmonary or systemic complications; and chronic single abscesses usually encapsulated. The first group of acute and multiple abscesses are dismissed with a couple of case histories for the author believes that they probably should not have been regarded as surgical problems and that intracranial operations should not have been done. In no case was operation successful. On the other hand the chronic encapsulated abscesses present a very fertile and successful field for neurosurgical intervention.

There are three principal methods of treating these abscesses: namely marsupialization, tapping and extirpation. Of these marsupialization should be attempted in a case of abscess that is within from

fewer successes, namely, an average of 83.7 per cent, or 436 cases

In regard to the time of operation, the primary suture promises the best results, within the first six months the time of intervention plays no important part in the secondary suture of the nerve when the mobility is maintained, after one or several years, operations on the nerves can still be carried out with success

The age of the patient plays no decisive rôle, even though at the age of over fifty years the deficient power of regeneration has a marked influence, and in the child improvements and aggravations are more marked

Of the nerve sutures, the direct suture promises the most certain result. Nerve transplants, grafts, and slits are permissible only when the direct suture is impossible. The surrounding of the sutured or freed nerves with fatty tissue has always proved useful. The after-treatment is of the greatest importance for the end-result. The relief of vasomotor-trophic disturbances is the most difficult

(SONNTAG) LOUIS NEUWELT, M.D.

MISCELLANEOUS

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The authors present the history of a family in which tumors of the sheaths or the enveloping

membranes of the nervous system appeared as a hereditary characteristic. This characteristic was transmitted as a mendelian dominant. The family consisted of 14 members. The condition was described in detail in six, a seventh had peripheral and possibly central neurofibromatosis at the time of death. In 3 the condition was proved at autopsy and in 2 it was proved clinically.

One of the cases studied at autopsy showed multiple subcutaneous tumors, multiple intracranial meningiomas, a cerebellopontine-angle tumor, multiple small tumors of the spinal-nerve roots, and four intramedullary spinal-cord tumors. These were all studied histologically.

In another one of the cases which were studied at autopsy, the spinal cord was not removed but the brain showed multiple intracranial meningiomas, bilateral cerebellopontine-angle tumors, and a choroid plexus tumor, as well as subcutaneous nodules and lightly pigmented areas. The third case showed a very large meningioma of the middle fossa with a small astrocytoma in the brain stem, the skin, cranial nerves, spinal nerves, and spinal cord were free from tumors.

After the histological consideration of the above cases, the authors came to the conclusion that the lesions were not only of the nerve sheaths but also of the enveloping membranes of the brain, they believed also that the glial elements might be included. They suggested that the "binding tissues" of the nervous system were affected, and that these should all be considered as possible sites for tumors in von Recklinghausen's disease.

ADRIEN VERBRUGHEN, M.D.

PERIPHERAL NERVES

Sorrel E., and Sorrel Dejerine Lesions of the Ulnar Nerve in Recent Closed Supracondylar Fractures of the Humerus (Les lésions du nerf cubital dans les fractures fermées sus-condyliennes récentes de l'humerus) *Mém. l'Acad. de chir. Par.* 1938 64, 461

In the last few years Sorrel and Sorrel Dejerine have seen 21 cases of injury to the nerves in recent closed fractures of the lower portion of the humerus, not including cases of Volkmann's contracture, a syndrome of a special type. In 15 of these 21 cases the ulnar nerve was involved, and 7 of these 15 cases were transverse supracondylar fractures. This relatively high incidence of ulnar nerve paralysis in fractures of the humerus of this type is surprising, as a review of the literature shows that ulnar nerve involvement in these fractures is very rarely reported. These 7 cases were observed among 207 cases of supracondylar fracture of the humerus with marked displacement which required hospitalization.

In 184 of these 207 cases the fracture was of the type that Kocher calls 'fracture of extension' in which the lower fragment is displaced in back of the upper fragment. No case of ulnar nerve involvement was observed in this group. In 23 cases, the fracture occurred during flexion, and the lower fragment was displaced in front of the upper fragment. All the 7 cases of ulnar nerve paralysis occurred in this group, therefore in this type of fracture the incidence of ulnar nerve paralysis was relatively high (30 per cent).

In fractures by flexion the ulnar nerve lying in its epitrochlear and olecranal groove is pulled forward and upward with the displaced epiphyseal fragment, and is distended and pressed upon by the lower border of the upper fragment. If this border is smooth and regular it is possible that replacement of the fragments and reduction of the fracture will

prevent further injury to the nerve. However if this is not the case pressure on the nerve by the irregularities of the upper fragment may continue even if the fracture is well reduced. In the cases reported there was only 1 in which reduction of the fracture was sufficient to relieve the ulnar paralysis. In the other 6 cases surgical intervention was necessary in 5 the nerve was extended by an osseous projection from the upper fragment in 1 it was compressed between 2 bony projections. It was not ruptured in any case, but was more or less flattened stretched, and always somewhat edematous.

The symptoms, which are those of ulnar paralysis develop somewhat gradually and as the nerve is not truly ruptured, the syndrome may be incomplete not all the muscles supplied by the nerve may be paralyzed. The paralysis was absolutely complete in only 2 of the authors' cases. Therefore the condition may not be evident immediately after the fracture and when it becomes evident it may be wrongly attributed to involvement of the nerve in the callus. In 4 of the authors' cases signs of paralysis were not noted until after the cast was removed, but in each case it was found at operation that the nerve was not involved in the callus but was injured by the upper fragment of the fracture. Early diagnosis, however, is desirable for recovery is more rapid if treatment is instituted promptly before the nerve has been severely injured.

AUGUST M. MEYERS

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Of 17 cases treated by nerve suture 7 were cured, 9 were improved, and 1 remained unimproved, and of 18 cases treated by neurolysis 6 were cured, 11 were improved, and 1 remained unimproved. The only failure from suture of the nerve affected the median nerve; the 3 other sutures of the median nerve resulted in cure, and the injuries of the ulnar nerve or the combined injuries of the ulnar and median nerves were cured or improved. Only improvements with the return of isolated muscle functions and certain sensory functions were obtained after severe plexus injuries. One hundred per cent cures were achieved with neurolysis on the radial and musculocutaneous nerves, however the time necessary for cure for the median and ulnar nerves was very long.

As compared with other clinics the results of Foerster were the best; he obtained 97 per cent success in his cases, and considerably more cures especially with neurolysis (more than double). These results are attributed to the thorough after treatment which could not be carried out to the desired extent in Freiburg. The other authors presented

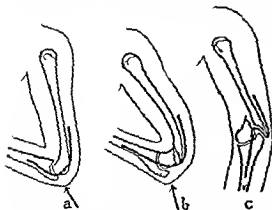


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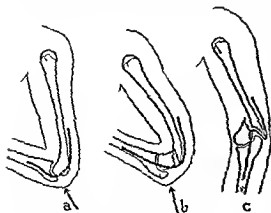


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Herbig B. End Results of the Operative Treatment of Nerve Injuries (Enderfolge der operativen Behandlung von Nervenverletzungen) *Beitr. z. klin. Chir.* 1937 166: 474

Of 41 cases of nerve injury operated upon at the Freiburg Clinic since 1928, 35 could be judged as to their end results on the basis of subsequent examinations or questionnaires.

Of 17 cases treated by nerve suture 7 were cured, 9 were improved and 1 remained unimproved. A total of 18 cases treated by neurolysis 6 were cured, 11 were improved and 1 remained unimproved. The only failure from suture of the nerve affected the median nerve; the 3 other sutures of the median nerve resulted in cure and the injuries of the ulnar nerve or the combined injuries of the ulnar and median nerves were cured or improved. Only improvements with the return of isolated muscle functions and certain sensory functions were obtained after severe plexus injuries. One hundred per cent cures were achieved with neurolysis on the radial and musculocutaneous nerves; however the time necessary for cure for the median and ulnar nerves was very long.

As compared with other clinics the results of Foerster were the best; he obtained 97 per cent success in his cases and considerably more cures especially with neurolysis (more than double). These results are attributed to the thorough after treatment which could not be carried out to the desired extent in Freiburg. The other authors presented

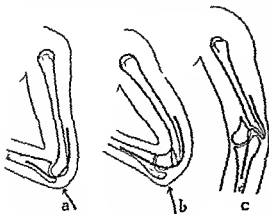


Fig. 1. Mechanism of supracondylar fractures of the humerus in flexion. Relation of the ulnar nerve to the fragments.

inserted. It is necessary to avoid injury only to the spinal nerve which descends along the internal border of the scapula.

A costal resection is subsequently performed. The fourth rib is resected over a segment of at least 8 cm, preferably from 10 to 12 cm. The periosteum is saved for about 1 cm beyond the osseous stumps on either side. This is necessary in order to obtain a proper closure.

The pulmonary apex is then freed by inserting a finger and a suitable pleural detacher between the costal wall and the parietal pleura. This manipulation should be performed cautiously because if done too rapidly it may cause an intense nervous shock. All the faces must be detached. As the plane of cleavage is more difficult to find on the mediastinal side and, also, because of the frequent presence of adhesions, detachment in this region is fraught with considerable difficulties.

In general, adhesions due to peripneumonitis are solid and difficult to break and in some cases the line of cleavage cannot be found. The adhesions should not be broken forcibly because this may lead to hemorrhage, perforation, and suppuration.

The wound is closed in layers without drainage. If the anterior route is chosen, the pectoralis major muscle is divided and a segment of the second rib, including its cartilage, from 10 to 12 cm long, is resected. Special attention should be given in order that injury to the internal mammary vessels be avoided.

In every case the detached area should be sufficiently extensive, reaching from the pulmonary apex downward to a point well past the principal lesion.

In order to maintain an artificial extrapleural pneumothorax, it is necessary to observe fluoroscopically the extent of the extrapleural pocket. Usually during the first few days following the intervention, the extrapleural pocket descends spontaneously to the level of the ninth rib or even to the diaphragm, which produces a total pneumothorax of the pleural cavity, and indicates an extensive pulmonary collapse.

The injection of 10 c cm of lipiodol into the pocket will give a better fluoroscopic visualization.

If the extrapleural pressure is too high, a puncture should be made to remove air or fluid. If the pressure is too low, lipiodol and air should be injected (usually from 50 to 75 c cm) to bring the pressure up to zero. During the first few postoperative days, positive pressures should be avoided to prevent emphysema.

The usual complications are (1) insufficient or excessive pressure within the extrapleural pocket, (2) emphysema, (3) hemorrhage into the pocket, (4) perforation of the cavity, either accidental or postoperative, (5) suppuration, and (6) focal reactions.

The immediate results are usually good and the patient's general condition rapidly improves. Expectoration subsides and sputum specimens are free from tubercle bacilli. The results closely resemble

those obtained from an artificial intrapleural pneumothorax. RICHARD E. SOMMA, M.D.

Harter, J. S., Overholt, R. H., and Perkin, H. J.: *The Lung Volume After Thoracoplasty*. *J Thoracic Surg*, 1938, 7: 290.

Pre-operative and postoperative determinations of the volume of the lung were made in 32 patients who were subjected to thoracoplasty as a part of the treatment of pulmonary tuberculosis. The method of Christie was used. For this study, only patients in whom thoracoplasty was the sole form of collapse therapy at the time of the last determination, were included. The time interval between the last operation and the postoperative determination varied from four to eighteen months. The condition of all patients was classified as apparently arrested, and all patients were ambulatory or working.

Eight patients showed a greater lung volume after thoracoplasty, the per cent change varying from plus 1 to plus 50. Twenty-four patients showed a reduction in the postoperative lung volume, the per cent change ranging between minus 5 and minus 50. The average pre-operative value for all patients was 2.3 litres and the postoperative value was 1.8 litres, the difference being 0.5 litres, with a standard deviation of plus or minus 0.22.

The clinical impression drawn from a series of 179 patients in whom far advanced disease had been arrested by thoracoplasty, and from 121 of these patients who were working, was that the great majority of patients rehabilitated by thoracoplasty do very well in respect to pulmonary function. These observations have prevented the authors from becoming unduly alarmed about the possibility of making the patient's condition worse physiologically than it was before. Relatively few of the patients complain of dyspnea on exertion, or show other effects of pulmonary deficiency, while a few, who had symptoms, such as tightness of the chest, wheezing, or dyspnea on slight exertion, have been relieved by selective thoracoplasty.

The re-adjustment of the size of the thoracic cage to the size of the healthy lung, the relaxation of distorted pulmonary tissue, the dropping of the hilus, and the return of the lower lobe to its normal limits may increase the patient's ability to use the remaining uninvolved lung.

Landman, T. H.: *The Surgical Treatment of Chronic Pulmonary Suppuration in Children, with Special Reference to Bronchiectasis*. *Am J Surg*, 1938, 30: 249.

The advances in the technique of surgical treatment of chronic pulmonary suppuration have been extraordinary in the past few years. The authors cite the cases of many surgeons who have successfully performed these operative procedures.

Chronic pulmonary suppuration in children presents certain features in its diagnosis and treatment that may be different from those in older patients. This report is particularly concerned with indications

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Jacobaeus H. G. *Bronchospirrometry J. Thorac. Surg.*, 1935 7 235

Bronchospirrometry is a method by which one is able to determine bronchoscopically the size and function of each lung. In respect to the isolated lung one is able to calculate its vital capacity of reserve air and residual air. Its oxygen intake and the carbon dioxide output are determined per unit of time. Experimental work has been done for a long time on animals to separate the respired air from each lung. Most of the methods are founded on a principle advanced by Pflüger in 1870 according to which a lung catheter was introduced with the distal end surrounded by a distensible rubber cuff which permitted the air from the respective bronchus to be led off. In the course of years it has also been possible to record the respiration from each lung by the use of a catheter of this nature. Generally, a preliminary tracheotomy was made and through the opening the necessary cannulas were inserted and the breathing was recorded on separate spirometers. In 1930, Anthony and Hansen tried thoracographically to get a new idea of the function of each lung. In 1932, the author saw the possibility of examining the lungs bronchoscopically and separating the air from each lung. He constructed a double bronchoscope so that the longer bronchoscope went into the right main stem bronchus where a distensible cuff was blown up which closed this bronchus so that the function of this lung could be studied. The larger bronchoscope which fitted over the smaller bronchoscope had a distensible cuff which when blown up closed the trachea so that the function of the left lung could be studied through its outlet.

After some experimental work it was found that in a normal person, the right lung carries from 53 to 54 per cent and the left lung from 46 to 47 per cent of the aggregate volume of both lungs. The author then takes up the possible contra indications to the use of such an apparatus and makes the statement that the only contra indication is a recent hemoptysis. He has used bronchospirrometry in cases of lung tumors, bronchiectasis, bronchostenosis and in postpneumonic conditions. A severe accident to the patient has never occurred.

The author then gives a series of case reports for the most part of patients who have pulmonary tuberculosis and shows the advantages of definite knowledge of the true function of each lung.

He calls attention to the fact that even in the presence of a pneumothorax on one side it can be proved by bronchospirrometry that this lung is functioning almost as well as when it was expanded. He gives a series of roentgenograms and compares the findings with those of bronchospirrometry.

The author summarizes the article by stating that the practical result of his study is that he is able, in a manner different from former methods to determine the function of the lung and to estimate the indications and contra indications for operation in the presence of bilateral affection. The method is also of importance in determining the magnitude of the operation to be performed. If cavernous changes are present in one part of the lung while the rest shows good function the operation should be confined as much as possible to the pathological part of the lung.

PAUL MERRILL, M.D.

Monod O. *Technique Indications and Maintenance of Extrapleural Pneumothorax (Technique indications et entretien du pneumothorax extrapleurale)* *Ann. méd.-chir. Par.*, 1935 3 1

Monod states that extrapleural pneumothorax is the highest expression of surgical apicolectomy. According to this author any therapy of pulmonary collapse employed in lesions involving the upper pulmonary lobes aims to free the apices. An apicolectomy has been produced in several ways: the commonest methods being scalenotomy, first rib resection, and thoracoplasty.

A new method to perform this operation extrapleurally is proposed by Monod. It differs remarkably from methods described by foreign investigators. The results obtained were studied in 40 patients. The technique involved may be described briefly as follows.

An extrapleural pneumothorax may be obtained by the posterior route: resection of the fourth rib or by the anterior route: resection of the second rib. The costal resection embracing a segment of from 5 to 10 cm. is sufficient to permit all the necessary surgical manipulations.

The posterior route is more frequently employed because the majority of the lesions are located centrally and posteriorly. Furthermore closure is more easily accomplished. The anterior route should be chosen in the presence of a cavity which is located near the anterior costal arches.

The patient is operated upon in the sitting position and local anesthesia with novocaine (1:200) is employed. The advantages are (1) free cough and expectoration and (2) better observation of the physiological reactions especially during the mediastinal detachment.

A rectilinear incision is made downward and outward extending from the spinous process of the second thoracic vertebra 4 cm. below the vertebral prominences to the internal border of the scapula about 2 or 3 cm. below its spine. This incision reaches exactly the fourth rib.

The trapezius muscle is incised externally and divided internally. The rhomboides muscle is divided and the serratus superior posterior is dis-

Sargent, E., Iselin, M., and Wiehn, P.: The Treatment of Large Residual Pleural Cavities by Pleurothoracopneumectomy (Traitement des grandes cavités pleurales résiduelles par la pleurothoraco-pneumectomie) *Arch. méd.-chir. de l'appar. respir.*, 1937, 12: 257

Since the establishment of a combined medical and surgical service at the Charity Hospital of Paris in 1929, the authors have made a special study of the treatment of large residual empyema cavities. In contrast to the pessimistic reports of most authors in regard to the hopeless nature of those cavities in which the apex of the lung is not in contact with the dome of the pleura, Sargent and his associates report excellent results. The present study is based on 11 cases. In 6 of these there was a tuberculous pyopneumothorax with secondary infection, in 4 there were fistulas following drainage of an apparently benign empyema, and in 1 case there was a very old empyema cavity resulting from a putrid infection. In 5 of the cases the cavity was total in extent with complete collapse of the lung. In the others the cavity was less marked in size but it was of moderate size in all. Except for the first case all were treated by the sequence of pleurotomy, thoracoplasty, and pleurectomy. There were 3 deaths and 8 cures.

The problem as expressed by the authors is that of a tuberculous patient who carries a residual empyema cavity following the drainage of a pyopneumothorax. What is to be done for him, when and how?

In the consideration of contra-indications, progressive disease in the opposite lung heads the list. Then are considered the four chief causes of a poor general condition: (1) extension of the tuberculous process in both lungs which cannot be controlled, (2) retention of pus due to improper drainage, which can be readily corrected, (3) "parietitis," or the involvement of the subpleural lymphatics by the inflammatory process, which may result in parietal abscesses, but can be readily drained, and (4) "septic pleurisy," a clinical entity characterized by toxic symptoms due apparently to the absorption of toxins from a large suppurating surface. This last condition can only be controlled by thoracoplasty which progressively diminishes the extent of the suppurating surface. Evidence of visceral degeneration, such as amyloidosis, makes the prognosis worse but is not a contra-indication for operation, which is considered to be the patient's only chance for survival. The authors' 3 deaths were all in this class.

In discussing the technique of pleurothoracopneumectomy the authors state that this combination of operations is not new, but they emphasize the importance of the systematic way in which the procedures are used.

Before an attempt is made to obliterate the residual cavity it is absolutely necessary to open the cavity completely and disinfect it as thoroughly as possible. The choice of the type of pleurotomy will depend upon the extent of the empyema. It must be large enough to insure adequate drainage.

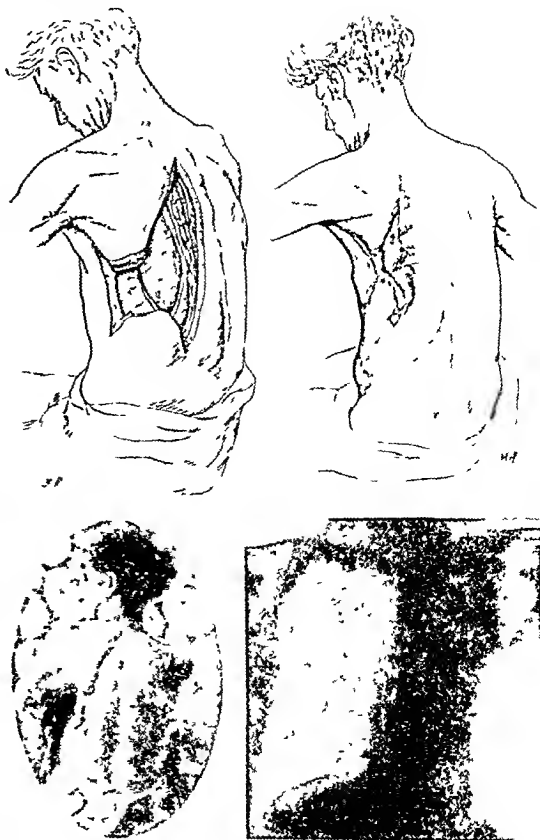


Fig 1. Putrid infection following oleothorax, a large cavity with pachypleuritis. Good result following simple drainage. Above, At time of pleurectomy and three weeks later, below, the late result.

Having obtained the objects of pleural drainage, one must proceed with the thoracoplasty as soon as possible and it should be completed within two or three months so as to obtain maximum collapse before the ribs regenerate.

At the first stage the upper 4 to 6 ribs, according to the patient's condition, are resected through a posterior approach. All of the first rib is resected.

At the second stage the anterior portions of the second, third, and fourth ribs are resected through an axillary approach.

The third stage consists of posterior resection of the fourth to eighth ribs.

The fourth stage is concerned with resection of the posterior segments of the tenth and eleventh ribs and anterior portions of the fifth, sixth, and seventh ribs.

Among the details of operative technique are stressed the importance of division of the serratus magnus muscle near its costal attachments and the disarticulation of the ribs from the vertebra without

for the radical treatment of bronchiectasis. The author has performed 7 lobectomies for bronchiectasis with no operative deaths and 3 total pneumonectomies for bronchiectasis with 1 operative death. All of the patients were under twelve years of age and all were submitted to one stage operation. The author gives a résumé of the cases.

In the discussion the author points out that the operative cases fall into 3 groups from the etiological viewpoint. The first group is that in which aspiration of a foreign body was the causative agent. The second group had a less definite cause although pneumonia and its complications as well as the infectious diseases seemed to play a part. The third group had an ill-defined or unknown cause. There was a long standing history of repeated upper respiratory infections and attacks of bronchitis.

In regard to the operative procedures nothing new was attempted. All operations were done in one stage and except for the single operative death, all patients had a very satisfactory operative recovery and convalescence. The author describes the technique used. He emphasizes the fact that care should be taken to use the proper anesthetic and that this should be given by a competent anesthetist. He also stresses the importance of routinely having the blood of the patients typed and having blood for transfusions available when the operation is ended.

PAUL MERRELL, M D

Edwards A T and Taylor A B. Vascular Endothelioma of the Lung. *Brit J Surg* 1938 25 187

Edwards and Taylor present 4 cases of vascular endothelioma of the lung presented by 3 women and 1 man whose ages varied from twenty six to fifty eight years. The tumors were confined to the parenchyma of the lung and the overlying pleura the pleural cavity being free from the neoplasm.

With the exception of Jackson's case of involvement of one of the right main stem bronchi there were no other similar cases in the literature.

The only symptoms of note in these cases were an unproductive cough and discomfort in the chest or upper abdomen. Pain was not a prominent symptom. Hemoptysis occurred in one case and physical signs were present in only one case. In the case of one patient a roentgenogram had been made two years previously which showed a pulmonary mass. The diagnosis of a pulmonary new growth was made by the usual methods of roentgenography with and without lipiodol instillation, artificial pneumothorax, bronchoscopy or thoracoscopy. In all cases the roentgenogram showed a homogeneous shadow clearly demarcated from the surrounding lung.

There has been no recurrence or evidence of metastasis in any case, the patients being alive and well after eight and one half, two and one half, one and one half and one year.

All of these patients were treated by a one-stage lobectomy. The authors mention Adler's contention that many tumors called endothelioma are actu-

ally carcinoma but they show photomicrographs of two of their cases which give strong evidence that the diagnosis of endothelioma is correct.

The article is accompanied by colored plates of the removed lobes.

ALTON OCHSNER, M D

Penberthy G C and Benson C D. The Management and Treatment of Empyema in Children. *Am J Surg* 1938 39 167

The treatment of empyema in children requires the careful attention of both pediatrician and surgeon. A thorough knowledge of the anatomy and physiology of the thoracic cage and its contents is essential in order that treatment may be on a rational basis. The observations and studies made by the Empyema Commission established by the Surgeon General of the Army in 1918 developed a number of fundamental basic principles which still form the foundation of our present day therapy.

When the empyema is a true abscess, either closed or open methods of drainage may be advocated. The authors present a uniform method of treatment combining the principles of both the open and closed surgical drainage methods. Four hundred and seven children with empyema were treated by these methods over a ten year period from 1926 to 1936 with a mortality rate of 10.3 per cent. Thirty five additional patients with empyema were treated by the same methods during 1936 and 1937 with a mortality rate of 8.6 per cent. There is a definite parallel between the mortality of pneumonia and that of empyema in any given series of cases treated over a period of years. The authors stress the fact that the frequent use of fluoroscopic and roentgen observation is very necessary in the follow up period of treatment to gain the best results.

Patients who show evidence of scoliosis complicating the empyema are placed on a Bradford Frame. When expansion of the lung is slow the Wangensteen method of suction materially shortens the period of morbidity.

In treating empyema individualization must be practiced as each patient demands his own particular form of therapy. A number of cases are presented illustrating the various types of empyema and their subsequent treatment along with the results.

The authors make the following recommendations:

1. The combined interest of the pediatrician, roentgenologist and surgeon is important in the careful management of a child ill with empyema.
2. Careful clinical and roentgenological examination is necessary.
3. Aspiration for diagnostic and therapeutic purposes should be done until true pus is obtained.
4. The combined method of trocar cannula catheter drainage followed by open drainage is recommended.
5. Attention to details which include blood transfusions as indicated and preservation of the normal water balance and nutritional status of the patient are essential to successful management.

PAUL MERRELL, M D

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Lazarus, J. A.: Neoplasms of the Abdominal Wall, with Special Reference to Malignant "Implantation" Tumors. *Ann. Surg.*, 1938, 107 278

A review of the literature with reported cases is given

An additional case of a female, aged forty-two, with a rather large tumor of the abdominal wall on the right side, is reported. Thirteen years previously she had had an oophorectomy for a supposedly benign ovarian cyst. Exploration with biopsy was done December 3, 1936. The diagnosis was adenocarcinoma. Francis Carter Wood stated that the specimen could very well represent ovarian tissue and noted a group of large cells extremely suggestive of arrhenoblastoma. Under irradiation the large mass in the abdominal wall reduced in size, but the patient developed a large hard node in the left groin. Her general condition seven months after exploration was good.

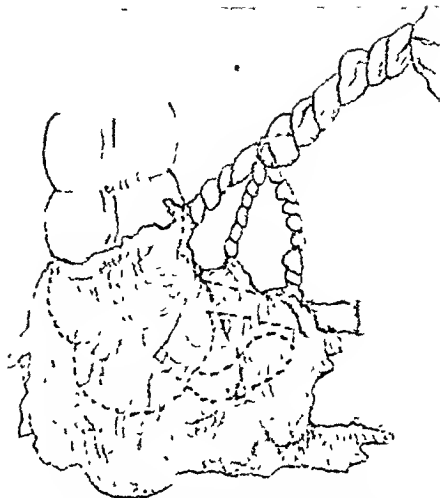
Lazarus states that biopsy is the only reliable means of determining the nature of a tumor of the abdominal wall. The prognosis is always bad. Treatment of small tumors consists of thorough abdominal exploration followed by extirpation of the growth and deep roentgenotherapy. In the large tumors extirpation is not advised as removal of large sections of abdominal wall always leads to serious postoperative herniation, without in any way adding to the life expectancy of the patient. This is not true of the less mutilating procedure of irradiation therapy.

CARL R. STEINKER, M.D.

Mauro, M.: Two Rare Cases of Intra-Abdominal Torsion of the Greater Omentum Complicated by Acute Appendicitis and Intestinal Volvulus (Due rari casi di torsione intraddominale dell'omento complicata ad appendicite acuta ed a volvulo intestinale). *Riv. di chir.*, 1938, 4 57

Mauro states that the differential diagnosis of acute abdominal syndromes should include torsion of the greater omentum because this lesion occurs more frequently than is generally believed. Since 1932 the author has been able to find 60 reports in the literature besides 2 cases which came under his own personal observation.

Concerning the pathogenesis of this very interesting condition, Cantacazène and Sorn have observed that in the presence of an intra-abdominal traumatized surface, the difference of potential between the omentum and the lesioned surface increases from 8 mv. to about 53 mv. According to these investigators the difference in potential causes the inferior margin of the omentum to be drawn toward the lesioned surface to which it finally becomes adherent. It is also interesting to note that these investigators have found experimentally that bac-



terial emulsions and certain dyes reduce the electrical potential to zero and thus prevent omental adhesions.

Other predisposing factors are abnormal shapes of the omentum, congenital malformations and torsions, inguinal hernia, especially on the right side; postoperative or idiopathic inflammatory processes which tend to alter the form, weight, and consistency of the omentum, tumors and cysts, changes in organs which are anatomically related to the omentum, such as ptosis of the spleen, ovarian cysts, uterine fibroids, inflammatory processes of the female adnexa, and appendicitis, and, finally, adhesions of the omentum to the abdominal wall or to the intestine itself.

Of special importance are the clinical relations of this condition to appendicitis. In about 50 per cent of the cases the condition is confused with appendicitis.

The author reports the case of a forty-year-old man with a right inguinal hernia which always could be easily reduced. The presenting complaints and clinical findings included pain in the right iliac fossa, abdominal rigidity, the presence of a fixed mass on palpation, and elevation of the temperature. A tentative diagnosis of acute appendicitis was made, but laparotomy revealed an acute torsion of the greater omentum. The peduncle was ligated and the omental mass was resected. Uneventful recovery followed.

The second case observed by Mauro was that of a fifty-year-old man who for the past years presented a left inguinoscrotal hernia. When seen at the clinic he complained of severe pain in the left iliac fossa. On operation an acute torsion of the omentum was found. The figure shows the omental mass which was

disturbance of the transverse processes. The rib beds are painted with formalin to retard the regeneration of the ribs. The intercostal bundles are ligated and divided down to the eighth so that the subsequent pleurectomy will be less bloody.

Following the thoracoplasty the patient returns to his sanatorium or to the country with two drains in his pleural cavity. His general condition progressively improves and at the end of from two to three months he returns very much better to have the final part of his treatment. Lipiodol is then injected into the residual cavity and roentgenographs are taken in different positions. If only a small tract remains it is probable that spontaneous recovery will follow and operation is not done. If a residual cavity persists one must proceed at once with the pleurectomy.

The operation of pleurectomy is done in one or more stages which depend on the patient's reaction. After excision of the pleural roof epithelization takes from three to six months. The length of time depending on the size of the cavity. The use of Davis skin grafts will shorten this period.

RICHARD H. MEADE, JR., M.D.

HEART AND PERICARDIUM

Barber H. Trauma of the Heart. *Brit M J* 1938
I 433

The author reports 20 cases of trauma of the heart 12 of which were the result of direct violence and 8 of which resulted from strain. Wounds of the heart are not considered in this article. Cases are also collected from the literature and discussed.

Heart trauma may be present without external bruising or injury to the chest wall. The left ventricle has been found ruptured, the auriculoventricular valve has been slit, both ventricles have been ruptured, there has been laceration of the heart muscle, the posterior cusp of the aortic valve has been found torn transversely and the mitral valve has been found ruptured, all without evidence of external trauma.

Experimentally on the dead subject rupture of a valve has been produced by striking the chest without injuring the bones of the thorax.

Barber himself has seen disease of the aortic valves following a fracture of the sternum over the base of the heart.

The clinical conditions which may follow direct violence or strain or both together include auricular fibrillation, auricular flutter and extrasystolic arrhythmia. The valvular lesions which may be produced are rupture of the aortic valve, lesions of the mitral valve and mitral stenosis.

Clinical conditions which may result from direct violence but not from strain are pericarditis, angina pectoris, heart block and contusion of the heart.

Primary cardiac overstrain may follow the strain of an athletic event, the effort syndrome or an intense unexpected effort for which the patient is not trained and during which the chest is fired with the glottis closed.

J. DANIEL WILLEMS, M.D.

ESOPHAGUS AND MEDIASTINUM

Keefer C. S. Abscess of the Mediastinum Following Acute Tonsillitis. *Ann Int Med* 1938
11 1426

An abscess of the mediastinum is a rare complication of hemolytic streptococcal infection of the throat. The author recently saw a patient who had acute tonsillitis and pharyngitis and who later had pain and difficulty when swallowing with pain between the shoulder blades, fever and leucocytosis. Examination and the roentgen rays showed signs of a mass in the posterior mediastinum. Through a posterior approach an abscess which contained hemolytic streptococci was drained. The patient recovered.

The author discusses the anatomy of this region and notes the reasons for the occurrence of abscesses in the anterior or posterior mediastinum. He also gives the following points upon which the diagnosis of a mediastinal abscess can be made:

1. History of the presence of a condition which is capable of causing a mediastinal infection.
2. Constitutional symptoms and signs of an infection.
3. Localizing symptoms and physical signs in the mediastinum due to involvement of various anatomical structures.
4. Signs resulting from an extension of the process to the neighboring organs.
5. Characteristic roentgen ray findings in the chest.
6. The finding of an abscess on exploration.

PALL MERRELL, M.D.

herger as being more suitable than others in demonstrating the tumor of the fundus. Holmes and Hamner have asserted that by allowing the patient to drink some contrast agent during the screening it is possible to observe how the contrast trickles down into the corpus in an abnormal manner if a tumor is present at that site.

The author contends that cancer of the fundus can be best diagnosed by direct demonstration of the soft tumor shadow itself in the gas bubble contained in the stomach. He recommends the use of some effervescent water to further clear up the picture. By letting the patient take some effervescent water the fundus can be better expanded and the tumor more readily seen.

Occasionally it happens that a tumor of the fundus grows to such a large size that the gas bubble of the stomach may be more or less missing altogether. The most difficult of all types of these tumors to diagnose are those that grow in an infiltrative manner in the wall of the fundus without forming any definite and projecting new formation. These can sometimes be revealed by the increased distance between the gas bubble in the stomach and the outline of the diaphragm.

In 33 of the 38 cases of cancer of the fundus reviewed by the author roentgenograms were available to the Roentgen Department of the Maria Hospital. They constitute an interesting review of the subject. The author points out that the demonstration of cancer of the fundus by roentgenograms constitutes no new advance in the roentgen diagnosis of the stomach, but he stresses the fact that these tumors are very easily overlooked. He expresses the opinion that the discovery of the presence of these tumors may afford an explanation for various symptoms sometimes found in a patient, such as abdominal symptoms of a diffuse character, emaciation, and a positive Weber reaction of the feces.

MATTHIAS J. SLIFERT, M.D.

Jones, T. B., and Morton, J. J. Congenital Malformations of the Intestine in Children. *Am J Surg*, 1938, 39: 382.

From a clinical point of view congenital malformations of the intestine in children may be placed into 2 groups: those requiring early surgical treatment, and those that may not require surgical treatment until later in life.

In general, the atresias and stenoses are the most urgent of all congenital anomalies of the intestine, regardless of whether they occur in the small or large intestine. The extent to which emergency measures are required varies directly with the distance of the site of obstruction from the pylorus. Obstructions due to internal hernias, intestinal malrotation, and hyperfixation often do not present the emergency features of the atresias. This is because such obstructions are frequently partial or intermittent in character, and are often relieved spontaneously only to recur some time later. The duodenum is secondarily involved in malrotation and abnormal

fixation, with the result that the symptoms are those of high duodenal obstruction.

Pre-operative treatment is concerned with the maintenance of the salt and water balance, and because many of the patients are so tiny this often presents a considerable problem. The subcutaneous, intraperitoneal, and, when possible, the intravenous administration of glucose, salt, and water overcomes dehydration and restores the loss of weight. This administration of fluid must be done persistently even though at times it appears almost impossible to give any more. Transfusion of blood, while not essential, is most beneficial for its stimulating effect, and is recommended. The majority of the patients have been operated upon under a light ether anesthetic given by the open drop method. A very small amount is sufficient and no undesirable effects from it have been noted when it is carefully given by a well trained anesthetist. Recently small amounts of morphine combined with local anesthetics have been used and found to be very satisfactory. The morphine is given hypodermically shortly before operation and has proved to be effective throughout the entire operation.

The operative technique requires extreme precision. Small delicate instruments and the finest of suture materials should be used. Silk should be used for sutures and the ligatures throughout. The least possible manipulation consistent with the correction of the deformity, absolute hemostasis, and extreme gentleness in the handling of tissues to prevent shock will require a rather long operative procedure. The exact operative procedure used to relieve the obstruction depends on the abnormality. When there is an absence of a segment of bowel or an extensive stenosis over a long segment, entero-anastomosis around the obstructed loop is the only logical procedure. In extrinsic anomalies due to abnormal rotation, descent, and fixation of the bowel, short-circuiting operations should not be done. These obstructions can be untangled and released. It is essential to secure a clear view of the mesentery, which can be done best by freeing the ascending and transverse colons medially. This brings the root of the mesentery clearly into view and allows the surgeon to untangle what at first appeared to be a hopeless situation.

The treatment of anorectal malformation requires the establishment of continuity between the rectum and the skin, which prevents constriction from scar formation. In all types of operations, repeated and persistent dilatations are necessary to prevent postoperative stricture.

Congenital intestinal abnormalities in older children differ from those in infants in that the anomaly *per se* is not incompatible with life. Superimposed complications, such as torsion, infection, volvulus, and hemorrhage, are often responsible for their discovery. Meckel's diverticula are usually discovered in the course of operation for an acute abdominal condition, often of undetermined origin. A most common complication is acute inflammation

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RICHARD T. SOMMER, M.D.

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JOHN W. MANN, M.D.

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SAMUEL J. SOGGESEN, M.D.

Stenstrom B. On Tumors of the Upper Pole of the Stomach. *Acta radiol* 1915 10 4

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In 33 of the 38 cases of cancer of the fundus reviewed by the author roentgenograms were available to the Roentgen Department of the Maria Hospital. They constitute an interesting review of the subject. The author points out that the demonstration of cancer of the fundus by roentgenograms constitutes no new advance in the roentgen diagnosis of the stomach, but he stresses the fact that these tumors are very easily overlooked. He expresses the opinion that the discovery of the presence of these tumors may afford an explanation for various symptoms sometimes found in a patient, such as abdominal symptoms of a diffuse character, emaciation, and a positive Weber reaction of the feces.

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In general, the atresias and stenoses are the most urgent of all congenital anomalies of the intestine, regardless of whether they occur in the small or large intestine. The extent to which emergency measures are required varies directly with the distance of the site of obstruction from the pylorus. Obstructions due to internal hernias, intestinal malrotation, and hyperfixation often do not present the emergency features of the atresias. This is because such obstructions are frequently partial or intermittent in character, and are often relieved spontaneously only to recur some time later. The duodenum is secondarily involved in malrotation and abnormal

fixation, with the result that the symptoms are those of high duodenal obstruction.

Pre-operative treatment is concerned with the maintenance of the salt and water balance, and because many of the patients are so tiny this often presents a considerable problem. The subcutaneous, intraperitoneal, and, when possible, the intravenous administration of glucose, salt, and water overcomes dehydration and restores the loss of weight. This administration of fluid must be done persistently even though at times it appears almost impossible to give any more. Transfusion of blood, while not essential, is most beneficial for its stimulating effect, and is recommended. The majority of the patients have been operated upon under a light ether anesthetic given by the open drop method. A very small amount is sufficient and no undesirable effects from it have been noted when it is carefully given by a well trained anesthetist. Recently small amounts of morphine combined with local anesthetics have been used and found to be very satisfactory. The morphine is given hypodermically shortly before operation and has proved to be effective throughout the entire operation.

The operative technique requires extreme precision. Small delicate instruments and the finest of suture materials should be used. Silk should be used for sutures and the ligatures throughout. The least possible manipulation consistent with the correction of the deformity, absolute hemostasis, and extreme gentleness in the handling of tissues to prevent shock will require a rather long operative procedure. The exact operative procedure used to relieve the obstruction depends on the abnormality. When there is an absence of a segment of bowel or an extensive stenosis over a long segment, entero-anastomosis around the obstructed loop is the only logical procedure. In extrinsic anomalies due to abnormal rotation, descent, and fixation of the bowel, short-circuiting operations should not be done. These obstructions can be untangled and released. It is essential to secure a clear view of the mesentery, which can be done best by freeing the ascending and transverse colons medially. This brings the root of the mesentery clearly into view and allows the surgeon to untangle what at first appeared to be a hopeless situation.

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which produces an earlier and greater rise in blood potassium. High potassium values were obtained in the gastric contents and were believed to account for at least some of the relief obtained by gastric lavage. The profound pulse changes are believed to be due to a hyperpotassemia. This belief is based on experimental work in animals and on human subjects. The altered potassium level in the blood and the beneficial effects of the administration of salt solutions in Asiatic cholera, intestinal fistulas, adrenal insufficiency, and in acute intestinal obstruction, are pointed out, and it is suggested that these effects might be attributed in part to the effect on the potassium metabolism.

THOMAS C DOUGLASS, M D

Bottin, J : The Relations between the Pancreas and the Intestine in Intestinal Obstruction (Les relations entre le pancréas et l'intestin au cours de l'obstruction intestinale) *Rev belge d sc méd*, 1938, 10 38

Bottin reviews the literature on the relation of the pancreas to intestinal obstruction. While in 1878 Salkowski suggested the possibility of pancreatic necrosis as a cause of some of the symptoms of high intestinal obstruction, it was not until after the work of Auché in 1900 that the relation of the pancreas to high intestinal obstruction received much attention. Auché reported experiments on rabbits in which he showed that intestinal obstruction in the region of the pancreatic duct caused more severe symptoms than obstruction in the lower portion of the small intestine. Since that time a number of authors have reported clinical observations and animal experiments showing that pancreatic necrosis is generally associated with high intestinal obstruction, especially when the site of the obstruction is near the pancreatic duct. However, in 1936 Audera, after studying 15 cases of intestinal obstruction in man, showed that necrotic lesions of the pancreas might also be associated with low intestinal obstruction. He considered that such pancreatic lesions might be due both to vascular changes and to reflux from the duodenum. A number of the experiments have shown that if the pancreas is excluded from the obstructed intestine, the life of the animal is prolonged. The lesions of the pancreas observed by the authors quoted have been diverse: cellular, hemorrhagic, and fatty necrosis may occur. In human cases both hemorrhages and fatty necrosis have been observed in association, this finding is less common in experimental animals.

In intestinal obstruction pathological changes have also been observed in other organs, especially the liver, but the pancreas appears to play the chief rôle, as is indicated by the prolongation of life in experimental animals by exclusion of the pancreas. Recently, in 1937, Brocq pointed out that the typical lesion of the pancreas in intestinal obstruction is not an inflammatory process, or pancreatitis, but a necrosis, apparently originating as a cellular necrosis, hemorrhagic and fatty necrosis are not constantly

observed, but the cellular necrosis is the important element that causes the typical symptoms.

ALICE M MEYERS

Hubbard, J. S., and Kremen, A. J. : The Effect of the Volatile Base in Fluid Intestinal Contents on Dogs with Low Intestinal Obstruction *Surgery*, 1938, 3 325

The authors report the results obtained in an experimental study of the volatile bases developing in the fluid contents of the intestine in dogs, following low ileal mechanical obstruction. Such developments were found to occur in concentrations varying from 0.14 per cent to 1.60 per cent. There appeared to be no correlation between the concentration of volatile bases, the duration of obstruction, or the condition of the experimental animal. The volatile bases were further analyzed for ammonia, and for primary, secondary, and tertiary amines. Ammonia was found consistently in about 50 per cent of the group, the remaining 50 per cent gave positive qualitative reactions for primary and tertiary amines, but negative reactions for secondary amines. Although the volatile bases are products of protein putrefaction, a pure meat diet only slightly increased their concentration in the fluid contents of the obstructed intestine.

The length of life in dogs with obstruction at the ileocecal junction was greatly shortened when they were fed a pure meat diet in contrast to an ordinary, or a meat-free diet. When the pH of the intestinal contents obtained from dogs dying of intestinal obstruction was raised to an antemortem level and placed into bowel loops of normal animals, toxic symptoms soon appeared, and were followed by death of the experimental animals. Likewise, the distillate containing the volatile bases was found to possess the same characteristics. In contradistinction to the toxic effects of the distillate, it has been shown that the action of the residue which is free from the volatile base is entirely innocuous. This does not necessarily signify that the volatile bases are the primary causes of death in intestinal obstruction, but it means that if they are present in a high enough concentration at an optimum pH, and if they are absorbed, severe toxic symptoms will occur, which will be followed by a fatal outcome.

JACOB M MORA, M D

Picchio, C : Intussusception and Its Evolution as Observed by Roentgen Examination (Le invaginazione ileo-iliaca e i loro stadi evolutivi nel quadro radiologico) *Radiol med*, 1938, 25 52

The difficulty of diagnosing intussusception is due to the extreme variability in the symptoms. This is caused by (1) total or partial reduction of the invagination, whether spontaneous or provoked by the technique of examination; or (2) the marked variety as to site, form, and extent of the condition. An invagination may develop in a portion of the gastrointestinal tract and present a diversity of symptoms which depend on the extent of intussusception.

leading to perforation and peritonitis. Acute intestinal obstruction is also frequent. More rarely the only symptom of a diverticulum is a chronic secondary anemia.

Several cases which can properly come under the heading of dolichocolon were encountered. There was hypofixation of the upper sigmoid with an unusually long and mobile mesentery in the adjacent colon. Such an abnormally mobile segment in juxtaposition to one which is abnormally fixed, results in obstruction because of kinking. Three cases were successfully treated by exteriorization of the redundant loop with subsequent removal of the spur and a secondary closure. This procedure is attended with very little disturbance to the patient and is very well tolerated.

MANUEL E. LICHTENSTEIN, M.D.

Röddén, S. An Experimental Study on Intestinal Movements. Particularly with Regard to Ileus Conditions in Cases of Trauma and Peritonitis. *Acta chirurg. Scand.* 1917, 80, Supp. 51.

The author reports a group of experiments carried out to study the intestinal movements in so-called traumatic ileus and in peritonitis. The part played by adrenaline in the inhibition of intestinal movements due to stimulation by way of the splanchnic nerve is studied. The intestinal movements in peritonitis were studied in animals in which the splanchnic nerve had been cut and in some in which it had not been cut and a group of experiments were made which showed the effect of drugs on intestine inhibited by peritonitis. The author describes in detail his method of inserting a window under sterile conditions in the abdomen of rabbits. This gave him a satisfactory method in the majority of instances to observe directly intestinal mobility and permit pictures to be taken at the same time. He discusses in great detail the normal movements of the small intestines of animals. It was found that trauma to the kidney caused a complete inhibition of all movements of the intestine and a decrease in tone. He demonstrated that this inhibition came through the splanchnic nerves. Experiments indicated that adrenaline had a limited effect on intestinal inhibition following stimulation of the splanchnic nerve.

An extensive study was made of the intestinal movements in various degrees of peritonitis and it was found that there is an initial complete inhibition when the intestine pales and the tone decreases. In reversible peritonitis there were generally pendulum movements of a greatly varying degree. Complete cessation of movements for one or two hours occurred. When the peritonitis receded rhythmic segmentation appeared first followed by a slow, tardy peristalsis and finally a rapid normal peristalsis. The initial inhibition was lacking in the splanchnic cotomized animals. These animals died of peritonitis in one third of the time of those not splanchnic cotomized.

The study of the stimulating effect of various drugs on an intestine inhibited by peritonitis shows

that prostigmine, morphine and sodium chloride lack secondary effects and produce lengthy movements which are normal in appearance. Prothigmine had the strongest effect. Dorsal esmodil, pilocarpine, pituitrin and ergotamine have secondary effects and give abnormal often rapidly passing movements.

ROBERT ZOLLINGER, M.D.

Scudder, J., Zwemer, R. L. and Whipple, A. O. Acute Intestinal Obstruction. *Ann. Surg.* 1917, 107, 161.

The authors have analyzed a series of 2,150 cases of acute intestinal obstruction from various hospitals all over the world. They have worked out an index combining the pulse rate, the respiratory rate and the amount of elevation or depression of the temperature and by plotting this index against the recovery rate they found that survival stands in inverse proportion and mortality in direct proportion to the index in 1,000 cases of strangulated hernia.

The results of operative procedures on this group of cases showed that the best recovery rate for reduction of strangulated hernia occurred in the presence of viable intestine. The addition of an enterostomy raised the mortality. In the gangrenous hernia a resection with primary anastomosis augured better than did the principle of marsupialization. In analyzing the 9,305 operations on viable intestine the relief of obstruction whether effected by division of the adhesions, detorsion of a volvulus or reduction of an intussusception offered the patient the best chance as shown by a recovery of 76 per cent in 150 cases. A primary enterostomy with the relief of obstruction raised the mortality rate in 149 cases. Grouped as to indices, the recovery rate was lower in those patients undergoing enterostomy who were below the age of 60 and about the same for those undergoing and those not undergoing enterostomy above this age. Enterostomy or rectostomy without the removal of the lesion gave a 50 per cent mortality, a figure worse than that reported by Treves in 1884. A short circuiting operation about the lesion failed to achieve the same success as removal of the lesion. In analyzing the 178 cases with gangrene of the intestine resection with primary anastomosis in the mildly toxic cases was preferable whereas resection with delayed anastomosis gave better results in severe cases. Again the exteriorization of the gangrenous bowel carried the greatest number of failures.

The similarity of the disturbance of potassium metabolism in acute intestinal obstruction and in adrenal insufficiency is pointed out and demonstrated in 25 cases of acute intestinal obstruction which are reported in detail. The increased mortality rate associated with interference of the vascular supply is attributed to the more rapid and sustained rise in the blood potassium. The increased mortality following enterostomy is believed to be due to failure to absorb the fluids and the intestinal contents and to the loss of fluids and electrolytes.

which produces an earlier and greater rise in blood potassium. High potassium values were obtained in the gastric contents and were believed to account for at least some of the relief obtained by gastric lavage. The profound pulse changes are believed to be due to a hyperpotassemia. This belief is based on experimental work in animals and on human subjects. The altered potassium level in the blood and the beneficial effects of the administration of salt solutions in Asiatic cholera, intestinal fistulas, adrenal insufficiency, and in acute intestinal obstruction, are pointed out, and it is suggested that these effects might be attributed in part to the effect on the potassium metabolism.

THOMAS C. DOUGLASS, M.D.

Bottin, J. The Relations between the Pancreas and the Intestine in Intestinal Obstruction (Les relations entre le pancréas et l'intestin au cours de l'obstruction intestinale). *Rev. belge d. sc. méd.*, 1938, 10: 38.

Bottin reviews the literature on the relation of the pancreas to intestinal obstruction. While in 1878 Salkowski suggested the possibility of pancreatic necrosis as a cause of some of the symptoms of high intestinal obstruction, it was not until after the work of Auché in 1900 that the relation of the pancreas to high intestinal obstruction received much attention. Auché reported experiments on rabbits in which he showed that intestinal obstruction in the region of the pancreatic duct caused more severe symptoms than obstruction in the lower portion of the small intestine. Since that time a number of authors have reported clinical observations and animal experiments showing that pancreatic necrosis is generally associated with high intestinal obstruction, especially when the site of the obstruction is near the pancreatic duct. However, in 1936 Audera, after studying 15 cases of intestinal obstruction in man, showed that necrotic lesions of the pancreas might also be associated with low intestinal obstruction. He considered that such pancreatic lesions might be due both to vascular changes and to reflux from the duodenum. A number of the experiments have shown that if the pancreas is excluded from the obstructed intestine, the life of the animal is prolonged. The lesions of the pancreas observed by the authors quoted have been diverse: cellular, hemorrhagic, and fatty necrosis may occur. In human cases both hemorrhages and fatty necrosis have been observed in association, this finding is less common in experimental animals.

In intestinal obstruction pathological changes have also been observed in other organs, especially the liver, but the pancreas appears to play the chief rôle, as is indicated by the prolongation of life in experimental animals by exclusion of the pancreas. Recently, in 1937, Brocq pointed out that the typical lesion of the pancreas in intestinal obstruction is not an inflammatory process, or pancreatitis, but a necrosis, apparently originating as a cellular necrosis, hemorrhagic and fatty necrosis are not constantly

observed, but the cellular necrosis is the important element that causes the typical symptoms.

ALICE M. MEYERS

Hibbard, J. S., and Kremen, A. J. The Effect of the Volatile Base in Fluid Intestinal Contents on Dogs with Low Intestinal Obstruction. *Surgery*, 1938, 3: 325.

The authors report the results obtained in an experimental study of the volatile bases developing in the fluid contents of the intestine in dogs, following low ileal mechanical obstruction. Such developments were found to occur in concentrations varying from 0.14 per cent to 1.60 per cent. There appeared to be no correlation between the concentration of volatile bases, the duration of obstruction, or the condition of the experimental animal. The volatile bases were further analyzed for ammonia, and for primary, secondary, and tertiary amines. Ammonia was found consistently in about 50 per cent of the group, the remaining 50 per cent gave positive qualitative reactions for primary and tertiary amines, but negative reactions for secondary amines. Although the volatile bases are products of protein putrefaction, a pure meat diet only slightly increased their concentration in the fluid contents of the obstructed intestine.

The length of life in dogs with obstruction at the ileocecal junction was greatly shortened when they were fed a pure meat diet in contrast to an ordinary, or a meat-free diet. When the pH of the intestinal contents obtained from dogs dying of intestinal obstruction was raised to an antemortem level and placed into bowel loops of normal animals, toxic symptoms soon appeared, and were followed by death of the experimental animals. Likewise, the distillate containing the volatile bases was found to possess the same characteristics. In contradistinction to the toxic effects of the distillate, it has been shown that the action of the residue which is free from the volatile base is entirely innocuous. This does not necessarily signify that the volatile bases are the primary causes of death in intestinal obstruction, but it means that if they are present in a high enough concentration at an optimum pH, and if they are absorbed, severe toxic symptoms will occur, which will be followed by a fatal outcome.

JACOB M. MORA, M.D.

Picchio, C. Intussusception and Its Evolution as Observed by Roentgen Examination (Le invaginazione ileo-iliaca e i loro stadi evolutivi nel quadro radiologico). *Radiol. med.*, 1938, 25: 52.

The difficulty of diagnosing intussusception is due to the extreme variability in the symptoms. This is caused by (1) total or partial reduction of the invagination, whether spontaneous or provoked by the technique of examination; or (2) the marked variety as to site, form, and extent of the condition. An invagination may develop in a portion of the gastrointestinal tract and present a diversity of symptoms which depend on the extent of intussusception.

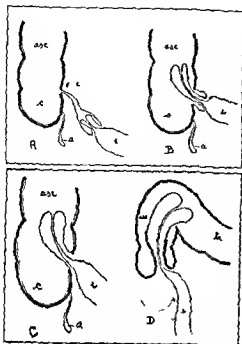


Fig. 1. A. Ileo-ileal invagination. B. Ileocolic (beginning). C. Ileocolic (more advanced). D. Ileoceocolic. asc = ileum vlc = ileocecal valve c = cecum a = appendix asc = ascending colon

The author notes that the greatest diagnostic difficulty is offered by those cases which have their origin in the small intestine. He presents a classification of the various types of intussusception which he has clearly illustrated with numerous diagrams and roentgenograms of actual cases (Fig. 1). The generally accepted classification (Monead, Renander, Laurell) is as follows: (1) invaginatio iliaca (ileum into ileum) (2) invaginatio ileocolica (ileum into the colon) (3) invaginatio ileocecale (ileum into the ileocecal valve or into the cecum) and (4) invaginatio colica (colon into the colon).

These types are described in detail by the author. Although ordinarily the intussusception occurs in the direction of the flow of the feces sometimes it can occur in an ascending direction as in the jejuno-gastric type.

As a result of the intussusception there are various degrees of stenosis. Above the lesion the intestine is dilated, the invaginating portion acts as a foreign body and is usually started by a tumor or abnormality in the intestinal wall, as is demonstrated by some of the clinical records submitted by the author.

The stenosis is the most common sign observed in roentgenological study of an intussusception. At the end of the intussusception the barium meal presents the appearance of the beak of a bird (becco d'uccello). The roentgen examination is carried

out both with a barium meal from above and a barium enema. In some cases the barium enema causes a characteristic filling of the various folds at the site of the invagination with the result that there is a characteristic trident defect.

The author proceeds to discuss in detail the roentgenological aspects of the various types of intussusception. He points out that in the colocolic type there is a certain ease and facility of passage of the contrast medium through the stenosis. The chief difficulty in the diagnosis of the colocolic cases is caused by the extreme variability of the radiological appearance. Examination by oral ingestion of the barium may be confusing in the latter cases. The ileo-ileal invagination is the most unsatisfactory as far as reliable roentgen findings are concerned. The chief sign is a stenosis. The scarcity of roentgenological data in these cases is due to the acuteness of the symptoms which usually contra-indicates roentgen studies. To satisfactorily study this condition with a barium enema it is necessary that there be a certain amount of insufficiency at the ileocecal valve. The author cites cases of his own and some of Renander and Malt to illustrate some practical aspects of the problems involved.

In conclusion he stresses the marked variability in the roentgen appearance of the various types of invagination due to various sites of localization and variations in extent of the process even in the same individual. In the presence of a patient with symptoms of intestinal stenosis intussusception should always be considered. JACOB E. LARSEN, M.D.

Ekstrand L. The Pathological Anatomy and Pathogenesis of Isolated Lymphogranulomatosis of the Small Intestine (Zur pathologischen Anatomie und Pathogenese der isolierten Darm-lymphogranulomatose). *Acta chirurg. Scand.* 1938 80: 317.

Although the nosological concept of Hodgkin's disease or malignant lymphogranulomatosis was established in 1832 it was not until 1913 that it was proved by Schlagenhauser that the intestinal canal may be affected by this disease. After that a large number of cases with this localization were reported but most of them were more generalized forms of the disease in which the gastro-intestinal involvement was secondary and had been found accidentally. The literature contains only about 50 cases of isolated intestinal lymphogranulomatosis and even this figure is probably too high as in the majority of the cases no autopsies were done. In this disease of which the cause is unknown the pathogenesis still undecided and the nosological unity in the pathology disputed there is still the danger that other simultaneous localizations may be overlooked even with systematic autopsies.

It is usually assumed that lymphogranulomatosis is a chronic infectious disease in which most often the mucosa of the throat less often the lower respiratory passages are the portal of entry of the virus. The intestinal canal has been assigned a sub-

ordinate rôle as a possible portal of entry, and this rôle has even been refuted by many prominent investigators of the subject, among others, by Fraenkel. In 1935, Graeff presented a valuable contribution to the pathogenesis of this disease by evidence of the not rare appearance of primary infection in the epipharynx, which had the original clinical appearance of a cervical-gland tumor.

Aside from the unknown cause of the condition, there are other factors that make it difficult to determine the pathogenesis. In most cases the onset of the disease can be determined from clinical factors, but sometimes even this is impossible, especially in the presence of internal localizations of the process. Often the diagnosis is confirmed only after propagation of the process to the external lymph nodes. Because of the late diagnosis and the frequent generalization of the disease, the autopsy often gives no clue as to the portal of entry and the path of dissemination of a possible excitant within the body.

The question, whether the disease is isolated or not, is also hard to answer, as the histological picture in the beginning of the disease may offer only slight and uncharacteristic changes, which may easily be overlooked. A number of cases in the literature considered as isolated intestinal lymphogranulomatosis must more properly be considered as the more general forms. Furthermore, regressive changes, either spontaneous or due to therapeutic interventions, make the determination of the type of the process impossible. The assumption that lymphogranulomatosis is a systemic disease with multiple primary foci within the lymphatic system still has adherents (Fraenkel and others). The cases with localization of the process in isolated organs or in one organic system, and in which the clinical data are in accord with the anatomical findings are particularly well suited to shed light upon this disease. If this concept, in accordance with Uehlinger's primary complex, is extended to include also those in which infiltrated lymph nodes are demonstrable in the mesentery, in addition to the intestinal involvement, the literature contains only 13 cases. Two cases that came to autopsy are reported by the author.

In the first case a man, aged fifty-six, complained of indefinite gastric pains, a palpable tumor, and pruritus followed by diarrhea and a marasmic state. Death occurred within half a year. The autopsy revealed multiple, partly ulcerating infiltrations, most marked in the jejunum, one of which perforated and produced a diffuse peritonitis, there was also considerable swelling of the mesenteric glands. Histologically, the infiltrations in the gut and regional glands showed a chronic inflammatory process that was interpreted as lymphogranulomatosis. The remaining organs were normal.

In the second case a man, aged sixty, who for many years had suffered with periods of exhaustion and an incurable enteritis which led to marasmus, died within ten months. The pathological and histological findings were practically the same as in the first case.

In neither case was there any bacteriological or histological evidence of tuberculosis, any hyperplastic states within the reticulo-endothelial apparatus analogous to the so-called reticuloses, or any leucemic or aleuemic conditions. The second case resembled a sprue-like state (fatty diarrhea) clinically.

A tabulation of the recorded cases of intestinal lymphogranulomatosis shows a slight preponderance of males. The age incidence is between eighteen and sixty-four years. The clinical picture varies somewhat. The main symptom is an incurable diarrhea resembling an idiopathic steatorrhea associated with leucopenia. In neither of the reported cases was there blood in the stools. The average duration of life is about eight months. Fever, either continuous or of the Ebsstein type, is inconstant. The blood picture gives no information, eosinophilia is rare. Pruritus has been reported. Laparotomy and histological examination are necessary to make the diagnosis. The clinical diagnosis most often is tuberculosis or cancer.

The process starts primarily in the mucosa and submucosa of the intestine, probably as a single area of involvement, whence it spreads via the lymphatics in the intestinal wall to the mesenteric glands. The infection is assumed to have taken place via the enterogenous route, so that the intestinal affection in connection with the infiltration of the tributary glands forms the primary complex of the disease, a condition which puts lymphogranulomatosis in the same class with other chronic infections and quite definitely contradicts the assumption that lymphogranulomatosis is a systemic disease with multiple primary foci within the lymphatic system. The author also calls attention to the likelihood that enterogenous infection in lymphogranulomatosis is more frequent than was formerly assumed.

LOUIS NEUWELT, M D

Paul, M., and Hill, W. C. O.: Right Duodenal Hernia. *Brit J Surg*, 1938, 25, 496.

The authors report a case of right duodenal hernia in a female aged three months. The infant was admitted with the history and physical signs of high obstruction, and died soon after admission.

The authors refer to Nagel (1923), who collected 29 cases of right and more than one hundred cases of left duodenal hernia. They point out that Treitz in 1857 suggested that such hernias originated in the intraperitoneal fossæ of Waldeyer and Landzert, and that Moynihan, Sir Astley Cooper, and F. R. Brown subscribe to these views. Edmund Andrews was one of the first dissenters to this explanation and gave a list of conditions which are found in duodenal hernia and which must be explained by some one theory. The list is as follows:

- 1 There is no vis a tergo to force the contents into the sac of a duodenal hernia. Differential pressures are utterly lacking within the abdomen.

- 2 There are hundreds of folds and fossæ in the peritoneal sac and they are never sites of hernia.

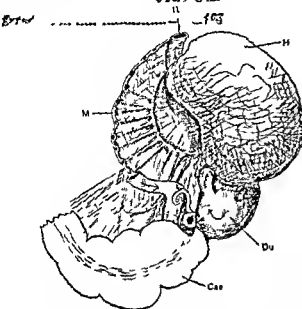


Fig 1 -Part of the abdominal viscera from the ventral aspect. The hernial sac has been turned upward and to the left to show its orifice. Its caudal pole is now at the top of the figure. H. Hernial sac. M. Emergent loop of ileum. Du. Termination of duodenum with commencement of jejunum entering the hernial sac. Ca. Cut edge of the mesentery of the free portion of the ileum containing an arterial arcade derived from the superior mesenteric artery and forming the boundary of the orifice into the hernial sac. Ca. Caecum.

3 In all but a very small minority of cases reported the degree of herniation has been total or subtotal. Vogt (1913) reports a case in which such a hernia was found to be total in an infant.

4 The herniated viscera are never anything but the small intestine. Omentum found in 9 out of 10 hernias at other sites has never been reported as having entered the sac. Fybus (1916) reports a case with a few inches of descending colon in the sac.

The authors give a complete anatomical description of their case and show that although the hernia rested to the left of the spine its origin was on the right, the sac having rotated so that its caudal end was cephalad in the early stages of the hernia (Fig 1). The rotation clockwise on its vascular pedicle with subsequent fixation on the left was due to the weight of the contents.

In explaining their case and at the same time satisfying the tenet of Andrews the authors show that the pouch commenced behind the stem of the superior mesenteric artery as the vessel was a part of the neck of the sac and the contents of the hernia were small intestine no omentum being present. They believe the one described is a mesenteric hernia similar to the ones described by Sir Astley

Cooper and by Brown. The hernia is so similar to the ones described as being produced by herniation into the fossa of Waldeyer, that surgically the two may be considered as the same. Actually however a right duodenal hernia into the fossa of Waldeyer is a mesenteric hernia at the root of the mesentery, i.e., it arises in the angle between parietal and mesenteric peritoneum, whereas a true mesenteric hernia is one in which the neck of the sac lies more peripherally, i.e., opening on the left side of the mesentery. The reason these hernias start at the root is probably that there is fixation from the mesenteric vessels and an absence of the ramus intestinalis. The entering intestinal loop is therefore always jejunum and peristaltic action speedily effects the entry of all or nearly all of the remainder of the small bowel. The view is advanced that the mouths of small congenital peritoneal fossae may be caused to gape by traction on the stems of vessels closely related to them more especially of vessels passing to highly mobile sections of gut. It is significant that the only fossae subjected to such influences are (a) the fossa of Landauer and of Waldeyer and (b) hypothetical congenital pouches in the mesentery and that these are the only ones so far proved to be associated with hernia formation.

ALTON OGDEN M.D.

Hansen E H. Cancer of the Duodenum Primary and Secondary. *Acta chirurg Scand* 1935 80 295

The author discusses the various diagnostic difficulties of carcinoma of the duodenum and the area surrounding from both a clinical and a pathologic anatomical point of view. The discussion is based on records and autopsy reports of 16 cases.

The carcinomas involved could be classified anatomically as follows: (1) carcinoma arising from the duodenal wall possibly from the stomach; (2) carcinoma arising from the extrahepatic bile passages; and (3) carcinoma arising from the pancreas.

The cases are presented in three groups, according to the most important symptoms: (1) intestinal obstruction; (2) intestinal ulceration; and (3) biliary obstruction. The importance of this grouping is emphasized but the transitions and overlappings of the groups are spoken of at the same time and illustrated by certain cases.

Among the single cases are to be mentioned 1 with hyperchromatic anemia in primary carcinoma of the duodenum and 4 cases of carcinoma of the papilla of Vater. The starting point of these tumors is discussed.

A radical surgical treatment of these carcinomas requires such extensive and dangerous operations that it is of the greatest importance that the diagnosis be made as early as possible at any rate a tentative diagnosis supplemented with explorative laparotomy and if possible with curative operation should be made. The importance of early diagnosis is quite evident from the large number of reports of successful operations for carcinoma of or surrounding the duodenum. JOSEPH K. SARAY M.D.

James, T. G. I : Chronic Regional Colitis. *Brit J Surg*, 1938, 25: 511

Tumor-like inflammatory masses in the intestine occur most frequently in the lower ileum, but a few reports indicate that other parts of the gastro-intestinal tract have been affected. Isolated involvement of part of the colon is distinctly unusual and for this reason James reports his case of chronic regional colitis.

The patient, a male nineteen years of age, complained of paroxysmal, colicky abdominal pains of seven weeks' duration. He had passed bright red blood in the stools and had lost considerable weight. Upon examination, tenderness was elicited in the left side of the abdomen where a firm, slightly movable mass could be felt. X-ray examination with a barium enema revealed a narrowing of the gut, which involved the distal part of the transverse colon, the whole of the descending and ileac portions, and the upper part of the pelvic colon. At operation, a small amount of serous fluid was found in the peritoneal cavity. The large gut from the distal part of the transverse portion to the upper part of the pelvic colon was firm and rubbery, and two or three times the normal size. There was a sharp demarcation between the unaffected and the diseased portion of the bowel. Resection of the affected portion of the large gut was performed. The specimen removed measured 15 in. in length. The lumen was extremely narrow, admitting only a medium sized probe, the gut wall was 2 cm. in thickness, and the mucous membrane showed numerous superficial ulcers. Convalescence was uneventful.

The clinical features emphasized in this case are abdominal pains, loss of weight, low-grade fever, anemia, diarrhea, and a palpable mass in the abdomen. The radiological findings were similar to those described by Kantor and designated as the "string sign." Pathologically, the changes are those of a non-specific granulomatous inflammation associated with ulceration of the mucosa and hyperplastic changes involving all the layers of the gut. The treatment indicated is resection of the involved section of gut. A two-stage operation may be necessary if obstruction exists. EARL GARSIDE, M.D.

Fraser, Sir J : Malignant Disease of the Large Intestine. *Brit J Surg*, 1938, 25: 647

In this critical review, Fraser discusses in detail the surgical considerations arising in relation to malignant disease of the large intestine. By way of preface, he discusses certain anatomical and physiological features of the colon. There is a sharp distinction to be made between the proximal and distal colons, both in lymphatic distribution and in nerve and blood supply. Fraser agrees with Mayo that the large intestine really begins near the splenic flexure, whereas the proximal colon, and particularly the cecum, is more nearly akin to a second stomach.

Analysis is made of 900 cases of carcinoma of the colon which were treated in the Edinburgh Royal Infirmary over a period of fifteen years, from 1921

to 1936. In 41 per cent of the patients, the site of the tumor was the sigmoid colon, in 10 per cent, the tumor was found to be in the splenic flexure, in 14 per cent, the transverse colon, and in 19 per cent, the cecum. There is no doubt but that the incidence of polyps is greatest in the terminal portion of the distal colon, and this may account for the high incidence of sigmoid cancer. No etiological factor aside from this association with polyp formation could be considered.

The adenocarcinoma is the characteristic malignant tumor of the colon. Its source is the epithelium of the mucosa and the stigma of its malignancy is its ability to invade the basement membrane and extend throughout the coats of the bowel wall. The epithelial cells proliferate and, as they increase in number, tend to differentiate and form incomplete acini somewhat similar to simple gland formation. The grading of the tumor can be based on this degree of differentiation.

Mucin production is encountered in tumors of all grades, but intracellular mucin is characteristic of the less differentiated tumors. Malignant-cell infiltration is associated with a varying degree of tissue reaction. This reaction may decide the clinical features of each individual case so that, according to the gross anatomy, carcinomas of the colon are conveniently classified as (1) soft medullary adenocarcinomas, (2) scirrhous or fibrous carcinomas, and (3) mucoid carcinomas.

Increasing attention is being paid to the importance of recognizing the early symptoms associated with carcinoma of the large intestine. Fifty-five to 60 per cent of the cases are inoperable by the time they come to the attention of the surgeon. Any change in the normal bowel behavior, however slight and without any known cause, which persists for more than a few days after adequate treatment is started, should demand careful investigation. Emphasis must be placed upon teaching the patient to observe his symptoms, and the general practitioner to evaluate properly the early findings in carcinoma. The final diagnosis rests with the specialist, the surgeon, and the radiologist.

In deciding upon the manner of treatment, carcinoma of the colon must be divided into three different groups: (1) cases without obstruction, (2) cases of chronic obstruction of a mild degree, and (3) cases of chronic obstruction which threaten to become acute. In the cases without obstruction three or four days should be spent in preparatory treatment. Intra-peritoneal vaccination is recommended by many authorities. Supportive, non-residue diet, transfusion, and other measures should be used when indicated. The types of operation will depend almost exclusively upon the location of the tumor. In tumors of the cecum, ascending colon, and right half of the transverse colon, a one-stage resection and an ileocolostomy is generally chosen. Tumors in the area from the right half of the transverse colon to the middle of the sigmoid are generally treated by the two-stage procedure of Mikulicz or

Rankin Distal to the middle of the sigmoid many types of operation are favored but as yet no uniform plan has been reached. In the cases demonstrating obstruction decompression of the obstructed segment is urgent.

The factors influencing prognosis are many. Cecal tumors grow rapidly and produce a marked anemia. Transverse colon tumors cause a widespread lymphatic dissemination. Tumors of the lower sigmoid have peculiar risks and dangers on account of the difficulties associated with their removal. The local extent of the tumor has great significance in the prognosis. With reasonably early diagnosis and sufficiently radical extirpation of the tumor bearing area the proportion of permanent cures is considerable.

EARL GARSIDE M.D.

Thorlakson P. H. T. and Hay A. W. S. Carcinoma of the Rectum and Rectosigmoid. *Canadian M. Ass. J.* 1938 38 107.

Cancer of the rectum can be diagnosed accurately. It is usually of low malignancy, slow to metastasize, more or less accessible and hence amenable to surgical extirpation. The authors stress the frequency with which malignant degeneration occurs in polyps of the large bowel. The diagnosis of carcinoma in the terminal portion of the large bowel is best made by feeling and seeing the growth but any disease which produces an ulcer, a mass, a stricture or which is characterized by the passage of blood or mucus must be considered in the differential diagnosis of cancer. The most difficult problem in differential diagnosis is presented by cases of diverticulitis involving the lower sigmoid of which about 10 per cent may become malignant.

In both rectal and rectosigmoid cancer adequate treatment demands complete abdominoperineal excision of the rectum and the lower sigmoid colon. In complete obstruction, the primary requisite is relief of the obstruction. The authors recommend cecostomy in cases of complete obstruction and permanent inguinal colostomy in cases which are not so severe. This is generally followed by prolonged medical care to decrease the operative risk. Prior to operation peritoneal vaccination is carried out.

The essential principle of all the abdominoperineal operations includes removal of the entire anus, rectum, ischioanal fat, levator ani, retrorectal tissues, mesosigmoid and the lower colon. Nothing short of this will succeed in removing all of the structures that may conceivably be involved in the extension of the growth. This procedure, which is described in detail, was attended by an operative mortality of 11.3 per cent in 44 operated cases.

Perineal excision and electrocoagulation are reserved for early cases or for cases complicated by various degenerative diseases which make for poor operative risks. Ten patients were treated by this method, with but one requiring a permanent colostomy. Under spinal anesthesia the tumor is exposed through a bakelite proctoscope and progres-

sively coagulated until the soft tissue is reached. Great care must be exercised to avoid injury of the adjacent tissues. It is generally necessary to divide the treatment into two, three or four stages. If the tumor is at all extensive a postoperative stricture always occurs but generally the rectum can be kept dilated. Whether or not this method is more than palliative is still open to question.

JOHN WALTSH FRYO M.D.

Gordon Watson Sir C. The Origin and Spread of Cancer of the Rectum in Relation to Surgical Treatment. *Lancet* 1938 234 230.

There is considerable evidence to show that in the large intestine hyperplasia followed by adenoma and then by carcinoma, is a common sequence of events and it is open to doubt if an epithelial tumor in this region is ever malignant in its earliest stage. It is not unreasonable to assume that cancer does not develop in this area without evidence of prior hyperplastic changes. In its earliest stages cancer of the rectum begins as a proliferation of epithelium protruding to a greater or lesser extent into the lumen, whether the malignant process commences in a level portion of mucosa (if it ever does) in a patch of hyperplasia or in a sessile or pedunculated adenoma. The surface of the growth enlarges by marginal increase and its depth increases by infiltration. Classification of rectal cancer into protruberant and ulcerating cancers is apt to be misleading, since these are not different types but different stages. No constant relationship exists between the extent of surface growth and the extent of deep infiltration.

In the condition known as polyposis intestinalis or adenomatosis which is generally a familial disease occurring in young people, it may be stated that malignant disease invariably completes the picture in those who fail to succumb from repeated hemorrhages or who have not been saved by total colectomy.

It is only to be expected that localized adenomatosis, as distinct from diffuse adenomatosis, should show the same tendency toward transition from benignancy to malignancy, and there is abundant clinical and pathological evidence in support of this. Multiple malignant tumors of the rectum or colon are occasionally found but they are seldom found without the co-existence of adenomas.

Numerous observations suggest that when a very early growth is found the whole area is potentially malignant and that the removal of one malignant tumor may stimulate further malignant change. If we can accept this theory, then a local removal as distinct from resection for even very early growths seems to be contra-indicated. It requires some courage however to advise radical surgery for a small malignant adenoma. When a colostomy is carried out as a preliminary to excision of a malignant growth of the rectum, it is not uncommon to meet with adenomas in the pelvic colon and some times even with an early carcinoma.

The general rule that lymphatic spread does not occur until the growth has broken through the rectal wall must be accepted. When lymphatic spread has occurred, statistics of perineal excisions show that however extensive the surgical procedure, the odds against a patient's surviving for five years are 5 to 1. In every case, the regional nodes lying against the deep surface of the growth or just above it are invaded in the first instance, and then invasion follows the glands along the superior hemorrhoidal vessels upward, usually in an orderly manner, to the inferior mesenteric group. In the cases of patients who are beyond the reach of surgical cure, and in whom the superior hemorrhoidal and inferior mesenteric nodes are obstructed by extensive metastases, cancer cells may be found in the middle hemorrhoidal area. When this happens, the ileac glands ultimately become involved. There is no tendency of the lymphatic invasion to spread from the inferior mesenteric chain, against the lymphatic current, along the paracolic vessels which drain the pelvic colon. Glandular metastasis usually progresses at a slow rate, and the surgeon is encouraged to attack growths that are obviously advanced, because he knows that even though lymphatic invasion has begun there is more often than not a considerable lapse of time before dissemination goes beyond the limit of radical excision.

It is clear from the high survival rates among early cases without lymphatic spread that venous metastasis does not often precede lymphatic invasion, but on very rare occasions, an undetected metastasis in the liver is a factor which upsets statistics.

Those who employed the combined operation for growths in all situations, to the exclusion of other methods, based their practice on the supposition that the lymphatic spread of this disease occurred in upward, lateral, and downward directions. Research at St Mark's Hospital, London, has shown that this occurs only in the most advanced cases which are beyond the reach of radical surgery, and that for all practical purposes the only spread is upward. With this knowledge, and the fact that there is no lymphatic spread until the growth has penetrated the muscular coats, and perhaps not until some time after this, the surgeon can plan his method of excision according to the situation of the growth and the stage that the disease has reached, provided that he can estimate this on clinical grounds. In the light of our present knowledge of the spread of the disease, the type of operation should depend on whether the growth is entirely below the peritoneum, partly above and below, or entirely above, as well as whether the disease is still a local one or has spread to the lymphatic channels. Those who advocate a combined operation for low growths, which can be removed with greater safety by a perineal excision, can find support for their practice if they regard a wide vulnerable area as a genuine danger. Without doubt, risks are run if multiple adenomas are left behind, and it may well

happen that this is the case even after an extensive combined operation. All growths below the peritoneum that are reasonably early and mobile should be removed by the perineal rather than by a combined method, or, in selected cases, by a sacral resection-anastomosis. Those that are partly above and partly below can, in many instances, be dealt with in the same way provided that they are not advanced, that preliminary laparotomy shows that there is no lymphatic spread, and that the pelvic colon is long enough to allow of a high division from below. It is true that for these cases the combined operation, either perineo-abdominal or abdominoperineal, is easier and in some instances more radical, but the operative mortality is probably about double.

When the growth is entirely above the peritoneal reflexion and there is a reasonable margin of normal bowel below, there is no occasion, based on sound pathology, for the removal of the rectum below the peritoneum. These cases can be dealt with best by means of the Hartmann operation, which has all the advantages of the combined operation in removal of the lymphatics along the inferior mesenteric vessels. The operation takes far less time than the combined method, and its mortality is quite low. All the inconvenience of a large perineal wound, which takes long to heal, requires a daily dressing, and involves risk of urinary infection, prolonged sepsis, and perhaps secondary hemorrhage, is avoided, and convalescence is shortened to at least half the time. Enough space to divide the bowel in an aseptic manner between clamps some 2 in. below the growth is almost essential. Additional space can often be secured after division of the peritoneum at its reflexion by gently mobilizing the rectum. Many lives have been cut short unnecessarily by a combined operation—lives that could have been prolonged and perhaps saved altogether by this less severe and yet entirely adequate operation for growths in this situation.

In general, it may be stated that in about half the cases that may be cured by surgery, the disease can be eradicated equally as well by local excision as by total proctectomy. Although this statement is governed by knowledge that can be acquired only after operation, it should nevertheless stimulate surgeons to reflect and consider a modified radical excision when conditions appear favorable.

When it is believed, on clinical grounds, that a growth above the peritoneal reflexion has not advanced beyond the B stage, a conservative resection anastomosis conducted from the abdomen is perhaps ideal, but careful selection is required. The risks of this type of operation increase if the patient is stout, if the mesentery of the pelvic colon is fat-loaded and short, if the growth is large and has contracted adhesions, and if it involves an anastomosis with that portion of the rectum which is uncovered by peritoneum. The mortality is higher for the male than for the female. To carry out a successful conservative resection within the abdomen, preliminary

drainage of the distal colon for some weeks is essential. A transverse colostomy, as advocated by Devine in 1937 and others is perhaps best. The risk of leakage at the anastomosis is diminished by division or stretching of the sphincters and by the passage of a tube up to the junction. Lately the author adopted Miles abdominoperineal operation.

In selected cases of growths lower down conservative resection and direct anastomosis can be carried out from below. Grey Turner used this method with considerable success in 1935. The fact that the lymphatics and vessels are enclosed in a definite sheath of pelvic fascia, as emphasized by Wood and Wilkie, enables the surgeon to perform this operation in early cases without a too extensive sweep out of the pelvis which may hamper the blood supply and excite sepsis at the junction.

The immediate success or failure of the various methods of conservative resection from above will depend to some extent on the conservation of the blood supply from above and on the degree of mobilization and absence of tension at the anastomosis, as well as on the avoidance of leakage and sepsis for which the preliminary measures already referred to are designed. The ultimate success will be determined by the existence or absence of extra rectal spread at the time of resection.

For all operable cases in which the evidence points to advanced disease with the exception of those growths above the reflection which can be dealt with radically by Hartmann's operation, the combined abdominoperineal or perineo-abdominal procedure is indicated. There are arguments in favor of the perineo abdominal method especially in cases of very large growths over which it may be difficult to close the pelvic floor. Advocates claim that there is less shock because the abdominal stage is shorter notwithstanding the fact that the perineal stage is longer and it is also argued that an operation begun as a perineal procedure can be converted into a perineo abdominal operation when conditions demand it. A laparotomy before beginning the perineal stage for examination of the liver and determination of the extent of upward spread is essential for this operation except perhaps in very early cases in which some less severe measure may often be applicable. The time occupied by this procedure is saved in the one stage abdominoperineal operation. Some surgeons prefer a two stage operation for either type so as to establish a colostomy in advance of the excision and in recent years the author has favored this procedure for both operations. However it may be urged that the presence of a colostomy adds to the risk of infection during the abdominal stage. Sometimes also adhesions following division of the colon hamper the main operation. Comparative statistics on operative mortality and end results may in time give some lead to surgeons about the comparative values of these two methods but the personal equation of the operators and the impossibility of obtaining a parallel series of cases is certain to vitiate statistics. These are highly specialized opera-

tions which whenever possible should be reserved for highly specialized surgeons who have perfected their technique on a large series of cases. Radical operations as distinct from conservative methods have attained a high measure of efficiency but will always remain tainted with the stigma of an artificial anus. The revival in recent years of conservative methods which allow complete eradication may help to remove this stigma.

The author has come to the conclusion that the results of radium treatment are too uncertain with our present knowledge to justify its use in an operable case except when a radical operation is contra-indicated on general grounds. In several instances though in a small proportion the author has reduced fixed inoperable cases to a state of complete quiescence, if not cure. Some of these patients remain in good health for periods ranging from seven to ten years. JOSEPH K. NARAT, M.D.

LIVER, GALL BLADDER PANCREAS AND SPLEEN

Fèvre M. and Dassios G. *Surgical Possibilities in Malignant Tumors of the Liver in Children and Adults* (Possibilités chirurgicales dans les tumeurs malignes du foie chez l'enfant et l'adulte). *J. de chir.* 1938 31 321

Fèvre and Dassios are of the opinion that the indications for surgery can be extended to certain primary or even secondary cancers of the liver and are not restricted merely to solitary adenomas with a tendency toward malignancy in that organ. Diffuse cancers of the liver diagnosed in a late stage are of course inoperable but the authors hope to demonstrate in this article that partial resection of the liver for malignant tumors is not as dangerous an operation as has been supposed and that it may give very encouraging results.

They report 3 cases illustrating the surgical problems presented by malignant tumors of the liver. The first patient was a girl eleven years old in whom a primary cancer of the liver was definitely circumscribed and a partial resection was done. Fourteen months later an operation for glandular recurrence was performed; the patient was well three years and three months after the first operation. The second patient was a boy three years of age; symptoms had been present but for a few months when exploratory operation was done. Yet the tumor had invaded the liver diffusely and removal was evidently impossible. The tumor ruptured during operation and the patient died a few hours later. In the case of the third patient, a girl nine years of age, the tumor ruptured and caused acute symptoms which necessitated operation. The rupture was sutured, the sutures being placed in normal hepatic tissue and holding firmly. The patient showed temporary improvement and gained in weight but died in five months.

The authors have collected 58 cases of malignant tumor of the liver in which some type of operation was done including the 3 cases reported above.

Twelve of these cases were solitary adenomas with a tendency toward malignancy, 36 were primary malignant tumors, and 10 were secondary malignant tumors. Among the 58 cases, resection was done in 48, an attempt at exeresis in 1, and an exploratory operation only in 9.

Solitary adenomas of the liver with a tendency toward malignancy are surrounded by connective tissue, but the latter is not a true capsule with a definite plane of cleavage between the normal liver tissue and the tumor. Primary cancers of the liver which are suitable for operation consist of a single mass or a central mass with small nodules around it, an area of sclerotic tissue around the tumor mass is a favorable sign, and indicates that the tumor is of slow development. Of the 36 cases of primary cancer of the liver in which operation was done, 11 occurred in children under fifteen years of age, in 5 of these resection was done, in 1 an attempt at exeresis was abandoned during the operation, and in 5 exploratory operations only were performed. It is important to note the relative frequency of primary cancer of the liver in children. Among the 10 secondary malignant tumors of the liver, the primary growth was at a distance in 6 cases, in 4 cases it invaded the liver by direct extension. Even in these cases removal of the secondary tumor may improve the patient's condition and prolong life.

In the diagnosis of malignant tumor of the liver, the chief sign is the visible or palpable tumor, it may be noted by the patient, or found by the physician in the course of a general examination. Pain is usually absent in the early stages, it occurs more frequently in adenoma with a tendency to malignancy than in primary cancer. Digestive symptoms, especially vomiting, are fairly common. Obstructive jaundice rarely occurs, it was noted in only 1 of the cases collected by the authors. Loss of weight is the most common general symptom, and may lead to the discovery of the palpable tumor by the physician, this loss of weight is often accompanied by fatigue, pallor, and anemia. Fever occurs more frequently in children than in adults. Solitary adenomas with a tendency to malignancy may persist for years without showing clinical evidence of malignancy, but primary cancer of the liver usually develops rapidly.

In the 10 cases in which exploratory operation was done, 4 with biopsy, there were 7 postoperative deaths. The reason for the deaths was that the operations were done in a late stage when the tumor was friable and hemorrhagic, and the patients were in poor condition. In considering the possibility of resection of a malignant tumor of the liver, the liver should be carefully inspected and palpated, if there is a single mass without diffuse involvement, it should be removed, even if it is large. Hemorrhage is more easily arrested if complete removal of the tumor is done. Even in partially encapsulated tumors, resection should be extended into normal hepatic tissue. Hemostasis may be obtained by the use of the electric cutting current, or by ligation.

In the 12 cases of adenoma with a tendency to malignancy in which resection was done, there were no postoperative deaths. One patient was not followed up, 8 had recurrences, 3 are living and well two years or more after operation. In the 8 cases with recurrence, the recurrence developed less than a year and a half after operation in 6, but there was 1 recurrence as late as three years after operation. Among the 26 cases of primary malignant tumor in which resection was done, there were 4 deaths within two weeks after operation, of the 22 patients recovering from the operation, 15 could be followed up. Of these, 7 showed recurrences, all within one year, 8 were living and well from one to four years after operation. In these cases of resection for primary malignant tumor of the liver, therefore, the operative mortality was low, and more than a third of the patients recovering from operation were free from recurrence from one to five years, when recurrences were found, it was always within a year after operation. Among the 10 cases of secondary tumor of the liver, in which partial resection was done, there were no postoperative deaths. The ultimate results depended upon the nature of the primary tumor, but in most cases, especially when the primary tumor was at a distance, the patient's condition was definitely improved. In 1 case in which the liver tumor was secondary to a goiter removed a year and a half previously, the patient was living and in good health eighteen months after removal of the hepatic tumor. In another case in which the hepatic tumor was secondary to ovarian tumors, the patient was living and well six years after the partial resection of the liver. The cases of resection of hepatic tumors from the literature are briefly summarized at the close of the article.

ALICE M. MEYERS

Beall, F. C. Stones in the Common Bile Duct. *Ann Surg*, 1938, 107: 238

The author believes that convalescence following cholecystectomy is smoother than convalescence following cholecystostomy, not primarily because of the relief of the back pressure or toxemia, but because of the conservation of bile which is lost in drainage operations on the bile tract. Patients with biliary fistula develop distressing symptoms, they are usually loss of weight, great weakness, anorexia, nausea, diarrhea, and a weak and rapid pulse. The administration of bile salts relieves these symptoms.

In obstructive jaundice there is a decrease in calcium which cannot be made up easily by the administration of calcium by mouth. If the bile salts are absent from the intestinal tract there can be no digestion of fats and, therefore, no fatty acids, which Cushny seems to think are essential for calcium absorption.

The author stresses the need for a more carefully planned pre-operative treatment. The great majority of patients with stones in the common duct are not in need of emergency surgery. They need carefully planned surgery, undertaken at the right time.

The author questions the need for drainage of the common duct. He again refers to the loss of bile which may turn the tide from success to failure in a seriously sick patient.

The author's practice is to close the incision in the common duct after the removal of the stones. He then places a soft rubber drain close to the line of incision in the duct. He believes that if the common duct is closed after removal of stones the patient will in most cases have an easier, quicker and safer convalescence.

HOWARD A. MCKNIGHT, M.D.

Elman, R. The Diagnosis and Treatment of Acute Non Hemorrhagic Pancreatitis. *Am J Digest Dis & Nutrition* 1938; 4: 232.

Elman believes that this type of pancreatitis is relatively frequent, but that it masquerades as another lesion. The present observations concern patients who suffered acute subsiding attacks of epigastric pain due to an acute process in the pancreas which was probably an inflammation in most of the cases but not of the hemorrhagic type and without evidence of necrosis. In the majority of these patients the original diagnosis did not refer to the pancreas; many of them were suspected of suffering from biliary colic, others from acute cholecystitis, perforated peptic ulcer, acute appendicitis, acute intestinal obstruction, and a few from coronary throm-

bosis. In the first cases observed the true diagnosis was revealed only at operation when the lesion in the pancreas was noted. Later it was possible to make a clinical diagnosis by studying the blood for its concentration of amylase. This determination when made at the height of the patient's symptoms and repeated as the clinical manifestations subsided revealed a striking correlation with the course of the attack. In a few patients both objective evidences of pancreatitis were obtained, i.e. the rise and fall of the blood amylase and the anatomical changes through biopsy of the pancreatic lesion.

For diagnostic purposes it suffices that the blood amylase reflects very rapidly and markedly acute changes in the pancreas.

A summary chart of 18 cases, all with characteristic blood amylase curves, is presented together with 2 charts showing the blood amylase curves.

The therapy advised and which was carried out in these patients after the attack had subsided depended upon the presence or absence of associated cholecystic disease as revealed by clinical and laboratory study, especially by cholecystography. The patients may be divided into 3 groups: those with cholecystitis, those without cholecystitis, and those who had already been cholecystectomized. Detailed therapy of the 3 groups is given.

CARL R. STEINKE, M.D.

GYNECOLOGY

UTERUS

De Moraes, A., and Bica, J. N.: Rhabdomyosarcoma of the Body of the Uterus (Rhabdomyosarcoma do corpo do utero) *Ann brasil de gynec*, 1938, 3 111

De Moraes and Bica observed a rare malignant tumor of the uterus which was found to be made up chiefly of striated muscular fibers of distinct embryonal character

The patient was a fifty-six-year-old Italian widow who had had 9 normal labors and 1 spontaneous abortion. Her menstrual periods had been regular up to two years before her present admission at which time she suddenly suffered a uterine hemorrhage. A diagnostic curettage was performed at that time but no conclusive results were obtained. Radium therapy was instituted and was continued for the last five months. Another severe hemorrhage followed, for which the patient received 2 transfusions of 600 cc each. Following a second diagnostic curettage, a diagnosis of sarcoma of the uterus of probable muscular origin was made.

Six days later a laparotomy was performed under spinal anesthesia. The round and infundibulopelvic ligaments were ligated and the uterus and adnexa were removed. Vaginal and abdominal drainage according to Mikulicz was instituted. One month later, roentgenological examination of the lungs proved negative and the patient was discharged from the hospital in good physical condition. A few weeks later she received, for a period of about twenty-nine days, 24 roentgen irradiations distributed over 4 fields extending up to the level of the umbilicus. The dose was 648 roentgens per field with a total of 2,736 roentgens.

Examination of the specimen removed at operation revealed a markedly enlarged uterus measuring 10 by 8.5 cm and weighing 550 gm. When the organ was opened, the uterine cavity was found to be distended by the presence of a large, freely movable polypoid mass which occupied the entire cavity and extended to the level of the internal os. This mass was attached by a pedicle to the right uterine horn and its surface presented a pinkish-yellow color with dark red to black spots which were distributed irregularly. In several places the tissue was undergoing necrotic changes. The ovaries and the tubes were normal.

Microscopic examination of the tissue revealed a proliferating neoplasm and the individual cellular elements presented a marked polymorphism. In some places the cells had an atypical, elongated appearance, and their nuclei were rich in chromatin, the latter being distributed chiefly around the periphery of the nuclear membrane. Aggregations of multinucleated cells were found here and there. In other places the cells were markedly polymorphic, pre-

sented fusiform and oval shapes, and giant cells with large nuclei were interspersed irregularly within these areas.

Special stains, such as Mallory's phosphotungstic-hematoxylin and Masson's, revealed the presence of rudimentary myofibrillar structures distributed along the cellular contours and best seen in connection with the larger and more atypical cellular elements. These myofibrillar structures stained deeply and were found to follow closely and uninterruptedly the cellular contours. The myometrium was slightly sclerosed and infiltrated with sarcoma cells which were also invading the endometrial mucosa.

On the basis of these findings, a pathological diagnosis of polypous rhabdomyosarcoma of the uterus with rudimentary myofibrillar differentiation was made.

The authors emphasize the rarity of this lesion and state that altogether only 10 cases have been reported in the entire literature.

RICHARD E. SOMMA, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Knudtzon, T. G.: Autotransplantation of the Ovary (Autotransplantatio Ovarii) *Acta obst et gynec Scand*, 1937, 17 407

The author describes the various forms of ovarian transplantation: homologous allotransplantation and isograft transplantation, autotransplantation, stalked and free transplantation. He then gives a short historical survey, in particular as regards autotransplantation of ovarian tissue in castrated women.

The object of ovarian transplantation is to remedy the deficiency symptoms and preserve the menstruation after the castration. The advantage of this treatment over the hormonal treatment is discussed in the original article.

Douay's method of transplantation was employed by the author. The grafts, about 2 by 1 by 0.3 to 4 cm, are inserted in the labia majora.

The author performed autotransplantation in 16 patients. Six of the cases are not included in the report because the time of observation was too short, the remaining 10 patients were observed from one to three years.

Of these 10 patients 2 were operated on for large uterine fibromas, supravaginal amputation with removal of the tubes and cystically degenerated ovaries was done, in 1 patient the adnexa were removed on account of bilateral dermoid ovarian tumors. Seven patients were operated on because of chronic inflammation of the adnexa, in 3 of these castration was performed at the first operation on account of severe and very extensive changes, in the remaining 4 castration was performed at a second operation because of relapses in the remaining adnexa or ovarian tissue.

The grafts adhered in 9 cases, in only 1 case was there no adhesion, that of a patient thirty-eight years old who presented a large fibroma. She gave the impression of having grown old prematurely. The menstruations had been slight and of short duration before the operation.

In 2 of the patients the graft functioned only during a short period, two and four months.

In 1 patient the grafts functioned but it was difficult to estimate the amount of function on account of the remaining ovarian tissue in the abdomen.

In 6 patients adhesion and function of the grafts occurred which showed in cessation of the ovarian symptoms and periodical vaginal bleedings more or less of the nature of menstrual bleedings. The grafts were still present on the occasion of the last examination from one to three years after the transplantation.

In 2 cases periodic hyperfunction of the grafts occurred which showed itself in persistent cyst formations in the latter together with prolonged irregular bleedings. In 1 case on reoperation and microscopy the bleeding proved to be due to an irregular glandular hyperplasia. The 6 cases presumably were cases of persistent follicular cysts showing inhibited luteinization and prolonged action of folliculin on the endometrium with resulting irregular glandular hyperplasia of the latter. As an antidote to this, luteinizing hormones such as Anter A should be injected. However the author himself has not had occasion to employ this hormone.

Some details are given regarding the mode of action and the local conditions of the grafts.

The results of the transplantations seem to favor their further usage.

Christidi E. and Pagarasanu I. Seminoma of the Ovary (Sur le séminome ovarien). *Lyon chir.* 1938 35 5.

After presenting an exhaustive treatise on the subject of seminoma of the ovary the authors report in detail 3 cases coming under their observation at the Brâncovenesc Hospital of Bucharest and give brief abstracts of 23 cases which they were privileged to observe.

Classifications of the solid tumors of the ovary have not been altogether satisfactory. Each attempt to clarify the subject has introduced a diversity of terms for the same clinical and anatomical tumor and added further to the already great confusion. Masson's epithelioma, spermatogenic Neumann's epithelioblastoma, germinative Mayer's epithelioma, seminiferous and Chenot's seminoma are the names given to only one of these tumors. The relative frequency of mixed elements in many of the solid tumors of the ovary also adds difficulty to the classification.

Historically Cheyassu in 1906 first made mention of seminoma of the ovary and since that time Chenot, Masson and many others have written extensively on the subject.

Histologically seminoma of the ovary does not differ from seminoma of the testicle. It consists in either case of a germinative epithelium with large clear cells containing great amounts of glycogen in its protoplasm. The cells are disposed in multilobular masses which conserve the configuration of medullary cords surrounded by a stroma of connective tissue and areas of leucocytic infiltration. The cell nuclei are large and stain well.

Macroscopically, the tumor varies in size from that of an apple to that of a seven or eight months pregnancy. It has a pedicle which may undergo torsion; it always metastasizes through the lymphatics; is frequently adherent to the surrounding viscera and, unlike other varieties of carcinoma of the ovary, is extremely sensitive to roentgenotherapy.

The diagnosis is never certain until the histological preparations are examined. The subjective and objective signs are of no value in direct diagnosis. The incidence is rare among the 24 solid tumors removed by Gosset; there were no seminomas, while Stoina and Stanculea found only 1 seminoma among 15 solid tumors of the ovary. Biological tests for the quantity of prolan A and B in the urine have been shown to be positive for seminoma. Russell, Ferguson, Downes and others studied the urine of patients with testicular afflictions and found that the reaction is positive only in patients with active neoplasms among which the seminoma is the most common. Of the authors 3 cases only 1 had been studied for prolan A and B and the reaction was positive.

The treatment of seminoma of the ovary can be no other than surgical. Since the tumor as well as its metastases is so radio sensitive roentgenotherapy should be complementary prophylactic as well as curative. The prognosis in general is good if surgery is combined with x-ray treatment; cures have been reported after six, eight and ten years.

Of the 3 cases reported by the authors 2 were seminoma of the ovary treated by surgery and with the roentgen rays and neither showed evidence of recurrence several months after intervention. One was a mixed tumor, an adenocarcinoma with extensive areas of seminoma which was treated in a similar manner but at the time of the report the patient was failing rapidly.

Of the 23 cases which the authors were permitted to observe all were treated by operation alone or in combination with x-rays. The immediate results were good but the follow up ranging from several days to five years was insufficient in most instances. One patient in the series had extensive metastases, 1 had a recurrence and 1 died.

GEORGE C. FINOLA, M.D.

Geist S. H. and Gaines J. A. Theca Cell Tumors. *Am. J. Obst. & Gynec.* 1938 35 19.

In analysis of the 6 cases of theca-cell tumors described in this article together with 5 cases published in 1935 indicates that a definite classification of such tumors is possible. These tumors may vary

from moderately fibrous types to those showing marked cellularity, or even malignant characteristics. To date, of the 22 theca-cell tumors reported in the literature, only 2 were malignant, one described by Loeffler and Priesel, the other one included in this paper. Genetically, the theca and granulosa cells have a common origin. In the course of neoplastic development, either a pure theca-cell or granulosa-cell tumor may result. Because of their similar genesis, it is not inconceivable that a tumor containing both theca and granulosa cells may occur.

The presence and distribution of fat within the theca-cell tumors is of particular interest. Fat occurs far more extensively within the cellular islands than in the connective tissue framework. Polariscopic examination reveals the lipid to be doubly refractile and indicates the presence of cholesterol or cholesterol esters. Examination of fibromas, spindle-cell fibrosarcomas, and many other ovarian tumors failed to show this characteristic fat distribution, but the phenomenon was demonstrable in a granulosa-cell tumor and, to some extent, in an arrhenoblastoma. Thus, of all the ovarian tumors that were studied, only those possessing masculinizing or feminizing tendencies had this characteristic in common. The chemical structure of both the male and female sex hormone is closely related to cholesterol. It would seem, therefore, that within ovarian neoplasms a definite association exists between the presence of doubly refractile fat, cholesterol and cholesterol esters, and the tendency to induce sex changes. It is interesting to note that the dysgerminoma, a tumor which has no secretory function and which does not affect the individual either in a masculine or feminine direction, fails to show intracellular fat.

Outside the ovary, such lipid storage may be seen in histiocytomas or xanthic fibromas of the skin, pseudoxanthomas, and xanthomatoses or xanthic lipoidoses. These, however, are apparently manifestations of a reticulo-endothelial system response to a destructive or irritant process, or to a disturbance in lipid metabolism. As is well known, some of these cases are associated with hypercholesterolemia. In one case of theca-cell tumor, recently published by Geist, no disturbance of cholesterol metabolism was found.

These tumors most commonly occur in women past the menopause, though they have occasionally been found before the climacterium. Atypical bleeding is the most prominent symptom in the postmenopausal cases, while metrorrhagia, followed by a period of amenorrhea, is frequently complained of in the younger women. There is often slight enlargement of the breasts and of the uterus. The endometrium presents a hyperplastic picture which resembles grossly and histologically that seen in other conditions due, presumably, to hyperestrogenemia. Operative removal of the tumors results in complete regression of the symptoms. Geist and Spielman were able to demonstrate large amounts

of the estrogenic factor in a theca-cell tumor. The tumor is usually benign, but 2 cases have been described which indicate its association with ascites, and 1 with metastases, presenting all the clinical and pathological evidences of malignancy.

The theca-cell tumors vary in size from that of a peach to neoplasms as large as a good sized melon. They are firm, irregular, solid, or partially cystic. A fibromatous-like consistency and appearance is often suggested. A capsule is commonly present and is deficient only when tumor tissue, as in the malignant case described, has perforated it. The cut surface is distinctive and shows lobules of yellowish hue and varying size, separated by strands of fibrous tissue. Cysts, when present, may be small or may almost completely replace the tumor, with occasional solid areas or thickened walls. The cysts result from degeneration and necrosis, and contain cloudy yellow or hemorrhagic fluid. The inner cyst wall sometimes has a shaggy appearance. Hemorrhage, necrosis, and liquefaction may also be found in the solid portions of the neoplasms. An association with other pelvic tumors has been noted in some cases but no relationship can be drawn between the theca-cell tumors and the uterine fibroids or ovarian cysts coincidentally found with them.

The outstanding feature of the histological composition is the presence of bundles of broad spindle cells, epithelioid in appearance and distributed in an irregular, interlacing manner throughout the tumor, which are separated by varying sized bands of connective tissue and often contain hyaline plaques. Fine fibrils traverse the intercellular spaces. The cells are usually regular in size, and the nuclei clear and well stained. An important diagnostic point is the presence of doubly refracting fat in large amounts within the cells and, to a lesser extent, in the surrounding connective tissue.

EDWARD L. CORNELL, M.D.

Hitzanides, M.: Virilism and Tumor of the Ovary. Report of a Case (Virilisme et tumeur de l'ovaire). *Bull. Soc. de gynéc. et d'obst. de Par.*, 1938, 27, 33.

Masculinizing tumors of the ovary studied by Meyer, and called *arrhenoblastomas* by him, are comparatively rare. This case, observed by Hitzanides in Athens in 1931, was reported in January, 1938, in Paris by Douay. The patient was a girl of nineteen years admitted because of an abdominal tumor. Menses began at fourteen years and remained normal for three years, then suddenly ceased entirely for two years. Coincident with the cessation of the menses, secondary male sex characters appeared. The voice became low and deep, and there was a marked growth of hair on the face, upper lip, chin, from the pubes to the umbilicus, and on the inner side of the thighs and legs. Four months later the abdomen began to increase in size. The breasts were small and flat, though larger than male breasts, the muscles, especially those of the neck and shoulder girdle, were very prominent. The external genitalia showed diminution in size of the labia with marked

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Christidi E and Pagirasanu I. Seminoma of the Ovary (Sur la tumeur ovarienne) Lyon chir 1938 35 5

After presenting an exhaustive treatise on the subject of seminoma of the ovary the authors report in detail 3 cases coming under their observation at the Brancovenesc Hospital of Bucharest and give brief abstracts of 23 cases which they were privileged to observe.

Classifications of the solid tumors of the ovary have not been altogether satisfactory each attempt to clarify the subject has introduced a diversity of terms for the same clinical and anatomical tumor and added further to the already great confusion. Masson's epithelioma spermatogenicum Neumann's epithelioblastoma germinative Mayer's epithelioma seminiferous and Chenot's seminoma are the names given to only one of these tumors. The relative frequency of mixed elements in many of the solid tumors of the ovary also adds difficulty to the classification.

Historically Chevassu in 1900 first made mention of seminoma of the ovary and since that time Chenot, Mas on and many others have written extensively on the subject.

Histologically, seminoma of the ovary does not differ from seminoma of the testicle. It consists in either case of a germinal epithelium with large clear cells containing great amounts of glycogen in its protoplasm. The cells are disposed in multilobar masses which can serve the configuration of medullary cords surrounded by a stroma of connective tissue and areas of leucocytic infiltration. The cell nuclei are large and stain well.

Macroscopically, the tumor varies in size from that of an apple to that of a seven or eight months' pregnancy. It has a pedicle which may undergo torsion. It always metastasizes through the lymphatics, is frequently adherent to the surrounding viscera and unlike other varieties of carcinoma of the ovary is extremely sensitive to roentgenotherapy.

The diagnosis is never certain until the histological preparations are examined. The subjective and objective signs are of no value in direct diagnosis. The incidence is rare among the 23 solid tumors removed by Gos et there were no seminomas, while Stora and Stanculesco found only 1 seminoma among 15 solid tumors of the ovary. Biological tests for the quantity of prolan A and B in the urine have been shown to be positive for seminoma. Russell Ferguson, Downes and others studied the urine of 11 patients with testicular afflictions and found that the reaction is positive only in patients with active neoplasms among which the seminoma is the most common. Of the authors 3 cases only 1 had been studied for prolan A and B and the reaction was positive.

The treatment of seminoma of the ovary can be no other than surgical. Since the tumor as well as its metastases is so radio sensitive roentgenotherapy should be complementary prophylactic as well as curative. The prognosis in general is good if surgery is combined with x ray treatment cures have been reported after six, eight and ten years.

Of the 3 cases reported by the authors 2 were seminoma of the ovary treated by surgery and with the roentgen rays and neither showed evidence of recurrence several months after intervention. One was a mixed tumor an adenocarcinoma with extensive areas of seminoma which was treated in a similar manner but at the time of the report the patient was failing rapidly.

Of the 23 cases which the authors were permitted to observe all were treated by operation alone or in combination with x rays. The immediate results were good but the follow up ranging from several days to five years was insufficient in most instances. One patient in the series had extensive metastases 1 had a recurrence and 1 died.

GEORGE C FINOLA M.D.

Gelst S H and Gaines J A. Theca Cell Tumors Am J Obst & Gynec 1939 35 37

In analysis of the 6 cases of theca cell tumors described in this article together with 5 cases published in 1925 indicates that a definite classification of such tumors is possible. These tumors may vary

ferent appearance, they are made up of large, clearly outlined cells, with acidophilic protoplasm containing doubly refractive lipid. Their architecture exactly resembles that of a gland of internal secretion. The origin of these cells is unknown, but they are believed to arise either in lutein cells or in aberrant adrenal cortical cells. It has never been proved that masculinizing hormones may be obtained from lutein cells. On none of these tumors has an adequate hormonal study been made before and after operation, and in the future it seems desirable that such studies should be made to help establish the nature of the disturbance. M. M. ZINNINGER, M.D.

Daniel, C., Mavrodin, D., and Wanef, A. A Study of the Permeability of the Tubes in Adnexitis (Recherches sur la perméabilité tubaire dans les annexites) *Gynecologie*, 1938, 37, 15.

Daniel and his associates note that tubal insufflation was originally employed to determine the permeability of the tubes in the study of sterility, the procedure was also found to have some therapeutic value in these cases. With improvements in technique and especially the introduction of kymographie insufflation, the usefulness of this procedure has been extended.

The authors have recently carried out tubal insufflation in 39 cases with inflammation of the adnexa, in 28 cases the involvement of the adnexa extended to both sides, in 9 cases to only one side, and in 2 cases there was pelvic cellulitis. The age of the patients varied from eighteen to forty-one years, 5 patients were from eighteen to twenty years of age and 5 over thirty-five years of age. The condition was acute in 14 cases, subacute in 10 cases, and chronic in 15 cases, as shown by the history and the presence or absence of fever, and the degree of leucocytosis.

Tubal insufflation was done in these cases five to fifteen days after the patients entered the hospital, seven to twelve days after the end of the menstrual period. Thirty-one of the patients had been treated only by rest and the application of an ice bag prior to the insufflation, 8 had been given from 1 to 3 injections of Delbet's vaccine (1 to 3 c cm).

For insufflation in these cases, pressures of from 100 to 270 mm Hg were employed without any undesirable effect. When the tubes were impermeable, the procedure was carried out three times at a pressure of 250 mm. When the tubes were permeable, it was also carried out three times at pressures of 250 mm or above (up to 270 mm). In the 37 cases of adnexitis, evidence of permeability of the tubes was found in 16 cases, in 7 cases both tubes were permeable at pressures of from 100 to 250 mm, in 2 of these cases insufflation had to be repeated before the tubes were permeable. In the cases with unilateral permeability, the right tube was permeable in 6 cases, the left tube in 3 cases. In most instances permeability of one tube was demonstrated in cases with bilateral lesions. In the 2 cases of pelvic cellulitis, both tubes were permeable, at a pressure of

150 mm in one case, and at a pressure of 250 mm on repetition of the insufflation in the other.

The authors conclude that the tubes are more often permeable in adnexitis than has been supposed, in their cases, permeability was demonstrated in 43.2 per cent, bilateral in 13.5 per cent and unilateral in 24.3 per cent. Repetition of the insufflation resulted in rendering the tubes permeable in 5.4 per cent of the cases of adnexitis. In the 2 cases of postpartum or postabortum cellulitis, the tubes were permeable, which indicated that inflammation of the cellular tissues is less likely to produce sterility than inflammation of the tubes. Tubal insufflation carefully and correctly done is a procedure that can be safely carried out even in acute and subacute adnexitis, and it is of value as an indicator of whether conception may take place or not. ALICE M. MEYERS

Whitehouse, Sir B. Salpingitis. *Canadian M Ass J*, 1938, 38, 1.

In this presentation the author emphasizes the value of vaginal or combined rectovaginal examination when there is doubt regarding the diagnosis and the symptoms are of little specific value. The presence of deep-seated and adherent inflammatory tubo-ovarian swelling, though readily appreciated by the pelvic route, is easily overlooked when reliance is placed strictly upon abdominal methods of diagnosis. In the presence of acute lesions, the diagnosis is of great importance, as an error may cost the patient's life.

The author believes that since the treatment of acute pelvic peritonitis of tubal origin differs essentially from that of acute appendicitis, something may be done or left undone which may be followed by disaster. This is true particularly of the danger associated with the approach to, and the removal of, a tube acutely inflamed by streptococci, or of the tapping of a streptococcal abscess by way of the abdomen to the exclusion of the safer vaginal route. In severe primary infections, there is danger of their extension to the general abdominal cavity, a risk which may be increased by injudicious treatment. The bacteriology of these infections has a direct bearing on the treatment instituted. Gonococcal infections are perhaps the least disturbing in their immediate effects. With time and palliative treatment, the majority of acute lesions subside, and the organisms die, the result being nothing more than a closing of the tubes and a mass of pelvic adhesions associated with chronic pelvic pain, which may eventually call for surgical treatment at a later but safer period. On the other hand, streptococcal and coliform lesions generally necessitate active interference in the acute stage. The author believes that this interference should be in the form of drainage, which should be done as quickly as possible, and his policy is to delay active interference as long as possible and then do as little as possible. He further emphasizes the danger of laparotomy in the presence of acute tubular inflammation, and strongly recom-

hypertrophy of the clitoris. The abdominal tumor was round regular painless, movable and reached 4 fingers above the umbilicus. The uterus was pushed down behind the pubic arch and to the left. At operation November 15 1931, there was found an enormous tumor of the right ovary, not adherent, and easily removed by clamping and division of its pedicle. The left ovary was small whitish and atrophied. The uterus was small but otherwise normal.

By March 1932, the condition of the patient had made considerable improvement. The hypertrichosis was less but the menses had not returned. Microscopic reports of tumor from both Athens and Paris stated that the tumor was malignant so that in March and April 1932 radiotherapy was given though the dosage was not reported. During the year 1932 all of the masculine characters disappeared with a return of the normal feminine characteristics. Hot flushes appeared. Early in 1933 the menses reappeared and remained normal up to August 1937 when the patient was last seen.

The pathological study of the tumor showed that it was the size of an adult head with a smooth surface but it was somewhat irregular and contained a number of cysts. On section it was partly cystic partly solid. The solid portion was clear gray with some yellow stripes. Hemorrhagic and necrotic areas were present. The solid part presented a sarcomatous structure microscopically but also contained some cubical cells resembling carcinoma. The cysts were lined by a regular layer of cuboid or flattened cells. A diagnosis of a polycystic carcinosarcomatous tumor was made in Athens. A portion of the solid part examined in Paris was called a globocellular sarcoma. More recent study has revealed a very few glandular tubules lined with cubical cells resembling those seen in atypical arrhenoblastomas.

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A. M. ZINZINER, M.D.

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The clinical syndrome of these tumors is most striking. There develops first a defeminization, a loss of the secondary female sex characters. The menstrual cycle becomes irregular and then ceases. The breasts atrophy and the uterus becomes small. The subcutaneous fat diminishes and the muscles become prominent. Accompanying these changes appear the signs of virilism. Hirsutism is the earliest and most frequent. The voice becomes deeper. The clitoris increases in size. The psyche and libido are modified.

With such a train of symptoms one might suspect first a tumor of the adrenal cortex but if an ovarian tumor is present it is more probably the causative agent and following its removal a striking transformation back to the normal takes place. If one ovary remains the menses return. If the tumor recurs or late metastases develop which is a rare event masculinization again appears. The modifications of the secondary sex characters are undoubtedly the consequence of the evolution of the tumor. The virilism which has been described in connection with dermoid cysts, mucoid cysts and granulosa-cell tumors generally consists only of hypertrichosis which may persist after removal of the tumor.

In the literature there have been reported 35 cases of true masculinizing tumors of the ovary. These may be divided into 2 histological groups.

The first group which includes 34 of the 35 cases presents testicular tumors of the ovary. The typical tumor of this sort is made up of tubules or canaliculi between which one finds large cells filled with fat that resemble the interstitial cells of the testis. This typical variety is rarely accompanied by virilism but the more atypical characters it shows the more active it is functionally. Most of the arrhenoblastomas show considerable variations in their architecture and it is the appearance of transitional zones which allows the diagnosis to be made. The atypical areas which one meets are (1) trabecular zones formed of pavement epithelium lying in a more or less loose stroma (2) tumor cells arranged in irregular cords which are separated by more or less hyalinized stroma and (3) completely atypical sarcomatous area. Multiple sections from different parts of the tumor should be studied as the appearance of the tumor may vary in different parts.

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mends that such cases as may require drainage be treated through the posterior fornix whenever it is possible.

Under palliative treatment, many acute cases subside for a time, then because of repeated attacks or persistence of the symptoms additional help in treatment is required. In the subacute cases the application of heat *per vaginam* has won great favor. In the presence of gross chronic lesions surgical measures are strongly advocated. When a fallopian tube has been damaged by chronic inflammation so that it is palpable *per vaginam* or *per rectum* as a swelling in one or another of the posterior quadrants of the pelvis recovery is unlikely.

Once surgery is undertaken one must not hesitate to remove both tubes if at all indicated as secondary laparotomy for the removal of the second tube has frequently been necessary in cases in which conservatism had been practiced.

ANTHONY F. SAVA, M.D.

Ferrari F. and Torrellis J. Pelvic Phlebitis in Metrosalpingitis (Les phlébites pelviennes au cours des métrosalpingites) *Gynéc. et Obst.* 1938 37 5

The authors review the vascular anatomy of the uterus and the tubes to call attention to the fact that the lymphatic ducts not only follow the venous channels of these organs but are also found in the walls of the veins. It thus appears logical to suppose that both the lymphatic ducts and veins may participate in the same inflammatory process involving the uterus and tubes not as separate entities but in conjunction with each other. In the parametrium and the hypogastric sheath the lymphatic ducts and veins maintain the same relationship and here also they may both participate in an infection of the cellular tissue.

In 1935 the authors advanced the hypothesis that pelvic phlebitis is much more frequent in the course of metrosalpingitis than is commonly supposed. In the present treatise they present evidence by reporting 3 personal observations of pelvic phlebitis associated with metrosalpingitis proved by histological preparations.

Of the 3 cases reported in detail 1 diagnosed as a pelvic phlebitis following cervical cauterization performed too early after an acute utero adnexitis was confirmed by operation. 1 was a femoral phlebitis following a metro salpingitis and 2 was a utero-adnexal infection with a streptococcus blood culture.

Sections for biopsy removed at operation in the acute subacute and chronic forms of pelvic disease frequently showed the following histology: (1) true vascular micro-abscesses in small vein walls injured by a suppurative phlebitis; (2) destruction of the wall in the larger vessels and (3) frequent recent thrombi within the lumen. The surrounding tissues showed the usual aspect of inflammatory reaction.

In résumé pelvic phlebitis in acute subacute and chronic metrosalpingitis is more frequent than is

commonly supposed. The 3 cases of phlebitis which complicate the operative sites are proof that pelvic phlebitis coincides with utero adnexal disease. Therefore it is important that operations do not follow too soon after the acute stages of the infection.

GEORGE C. FROLA, M.D.

Weerasdoerfer J. A Contribution to Primary Carcinoma of the Tubes and Tubo Ovarian Cysts (Ein Beitrag zu Primärcarcinomen von Tuben und Tuboovarialcysten) Erlangen Dissertation 1937

The author discusses 5 cases of tubal carcinoma. Three of the carcinomas were primary in tubo-ovarian cysts; one was primary in the tube and one was regarded as a metastasis from a primary uterine carcinoma in a tubo-ovarian cyst. The average age of the women was fifty three years. They were therefore from three to five years older than the women included in the statistics of Nuernberg. Two women had borne children once. Neither the clinical symptoms nor the objective clinical findings were indicative of a tubal carcinoma. In every instance the lesion consisted of a papillary adenocarcinoma. In 3 cases the carcinoma in the tubo ovarian cyst occurred on the left side and in 1 case on the right. The case of primary tubal carcinoma likewise occurred on the left side. In the 3 cases of tubo ovarian cysts the carcinoma had its origin in 2 instances in the ovarian portion of the cyst. In 1 of the 3 cases the tumor had broken through the wall and in the other the carcinomatous epithelium had been carried into the uterine cavity from the cornu of the uterus as the result of muscle contractions. Only 1 case presented a true salpingitis although the tubo-ovarian cyst represents *per se* a previously existent inflammatory process. For this reason an inflammatory genesis of the carcinomas is to be considered. In 3 of the cases no information concerning the late course following operation could be obtained of the remaining 2 cases 1 terminated fatally two days after the operation and the other seven weeks after operation. (BAMBERG) HARRY A. SALZMAN, M.D.

Strassmann P. Childbirth after the Creation of an Artificial Uterine Cavity by Implantation of One of the Tubes into the Vagina (Geburt nach vaginaler Umpflanzung der Tube zur Wiederherstellung des Cavum uteri) *Zentralbl. f. Gynäk.* 1937 p. 2594

The author restored the uterine cavity in a twenty-one year-old woman after it had been completely obliterated following a curettage and in accordance with his method introduced one of the fallopian tubes into the recanalized uterine cavity. Not only did menstruation return but the patient became pregnant. The implanted tube became in effect a gravid uterus within the uterus. Delivery conducted by Bock was spontaneous; a portion of the placenta was retained in the lower uterine segment and had to be separated with the fingers. The placenta was plainly formed in three parts connected by narrow bridges of placental tissue. As a

whole, the placenta was large in relation to the somewhat undersized child. The heterotopic chorionic villi situated in the lower uterine segment were partially thinned. The surface increase, however, served as compensation in the interest of the nutrition of the fetus. The most interesting feature of this unique result of Strassmann's procedure of implanting the tube into the obliterated uterus was the transformation of the fallopian tube into a gestation canal. Not only did the tube take over the function of the uterus in the menstrual cycle, but the endometrialized tube served satisfactorily as a nidation floor for the fertilized ovum.

The author proposes as a subject for discussion and therapeutic proof the possible value of implantation of a fallopian tube into a still existent but functionless uterine canal in cases of amenorrhea and sterility (H. FUCHS). FLORENCE A. CARPENTER

EXTERNAL GENITALIA

Sjamssoeddin: Tuberculous Ulcer of the Vulva
(*Ulcus tuberculosum vulvæ*) *Geneesk Tijdschr Nederl-Indie*, 1937, p. 1953

Among 3,802 female patients treated since 1930, the first case of tuberculous ulcer of the vulva was observed in a girl of six years who came from a tuberculous environment.

The pathologico-anatomical examination disclosed the probability of tuberculosis, the vaginal examination suggested a tuberculous infection with a mildly positive Pirquet reaction, and roentgenological examination corroborated the vaginal diagnosis. The bacteriological tests decided the diagnosis; the microscopic slides disclosed the tuberculous organisms and the biological tests in animals were positive for tuberculosis. These steps fully established the diagnosis. The differential diagnosis is discussed in detail.

(LAMERS) MATHIAS J. SLIFERT, M.D.

MISCELLANEOUS

Ito, H.: On the Symptoms of Ovulation. *Jap J Obst & Gynec*, 1938, 21, 9, 22

In the examination reported herewith by the author, the students, 75 in all, of the two higher classes of the Osaka Medical School for Women were used. The number of ovulations reported upon was 245. Symptoms observed upon themselves were tabulated by the examinees on cards prepared for that purpose.

The most frequent symptom of ovulation was leucorrhea, which occurred in 81.3 per cent of the cases. The next was the feeling of distention in the lower abdominal region, which was present in 43.8 per cent. Fatigue, languor, mental depression, feeling of distention in the lumbar region, and pain in the lower abdomen came next.

Using these reports of symptoms to reckon the time interval from ovulation to the subsequent menstruation, the author found that the symptoms

of ovulation began to appear from ten to nineteen days before the subsequent menstruation in the great majority of cases. Hence, by observing carefully the symptoms of ovulation, a woman might know her conception term without counting it actually in days.

The author is led to the conclusion that in a large percentage of healthy women some symptoms could be found in a time period concurrent with the ovulation term. For the most part these symptoms appeared from twelve to sixteen days before the next menstruation. No regularity was found in their appearance by reckoning from the preceding menstruation. The average duration of the ovulation symptoms was two and eight-tenths days. Even in healthy women, by careful observation the ovulation term was noted and accordingly the first day of the next menstruation could be foreseen. This was especially convenient in the cases of menstruation in an irregular cycle. The practical value of this study is that when known, the symptoms of ovulation can serve as a guide when pregnancy is desired or not.

In the author's second report, data obtained from the examination of 170 women doctors and medical students and 361 nurses are reported. The total number of ovulations amounted to 636. The same items for observation were used in the same manner as in the first report. The most frequent finding was leucorrhea, which occurred in 82.11 per cent of the cases. In 37.4 per cent physical languor, ease of fatigue, a feeling of tension in the breasts and of distention in the lower abdomen, sleepiness, mental depression, and pain on pressure on the breasts came next. In the study of the time relation between the appearance of symptoms and menstruation, the results were quite in accordance with those of the previous report. The number of days, counted reversely from the day before the subsequent menstruation, was nearly constant in each individual. It was generally from ten to twenty days, mostly from twelve to sixteen. No constant value could be obtained when the number of days was counted from the preceding menstruation. About 70 per cent of the women doctors and women medical students were able to recognize the ovulation term from the symptoms, whereas among the nurses the percentage was as low as 40. This difference might be accounted for by the fact that the doctors and medical students had learned to observe themselves in the first examination, reported in the previous article by the author. On the other hand, because so much of the time of the nurses was occupied by their duties, and because they were not so well educated for the observation, there was a smaller percentage making a correct observation.

The author discusses the mechanism of ovulation symptoms and states that there is no established view as shown by a review of the literature. The leucorrhea is caused by congestion of the genital organs. It is the opinion of the author that the ovarian follicular hormone produces congestion and

swelling of the uterus. It is secreted through the whole course of the menstrual cycle but is changed periodically in its quantity. Other investigators note that a larger amount of follicular hormone is discharged into the urine during the ovulation term. By its action at this time the genital organs are congested. The feeling of distention may be caused by a stimulus to the peritoneum as well as by the congestion in the genital organs. The symptoms felt in the body generally such as languor, nausea and vertigo, probably originate from vagotony. Inasmuch as the ovarian follicular hormone is now used widely to stimulate the secretory action of the breasts, the feeling of tension and over sensitiveness of the breasts in the ovulation term seems to originate from the active production of this hormone.

In conclusion of this second study, the author finds by observing a much larger number of ovulations that the most frequent symptom is leucorrhea. The women who reported a feeling of distention in the lower abdomen and lumbar regions noted that the symptoms were separately on the right or left side in about one third of the observations.

The same symptoms of ovulation occurred in the menstrual period in a relatively large number of cases. However, their intensity bore no relation to the intensity of the symptoms of the menstrual period. In the majority the ovulation symptoms had a duration of from one to five days and most frequently for three days. The average duration was two and nine tenths days. This compares closely with the findings in the first report. In the second

study it was apparent that as the women became more experienced in their observations the more certainly they could recognize the ovulation term.

HERBERT F. TUTTLE, M.D.

Novak, E. The Menopause and Its Management.
J. Am. M. Ass. 1938 110 619.

A distinction must be drawn between the treatment of menopausal symptoms and the management of the woman passing through the menopause. The well known vasomotor group of symptoms are the only ones which seem clearly attributable to the hormonal readjustment of the menopause although it is possible that others may at times be produced directly. However, the woman who is passing through the menopause may present many other manifestations of only indirect significance and yet often constituting real problems in treatment which must be along psychic and general rather than endocrine lines. Only a minority of women need medical treatment during the menopause, and a much smaller proportion require organotherapy.

While the mechanism of the vasomotor menopausal symptoms is not clear, the immediate factor is quite certainly the cessation of ovarian function and ovarian therapy with the now available effective preparations of estrogens is a rational procedure. The results are variable, rarely brilliant, but often satisfactory to both the patient and physician. Light irradiation of the hypophysis may be tried if organotherapy is unsuccessful, but its too promiscuous use should be discouraged.

CHARLES BARON, M.D.

THE TREND OF OBSTETRICAL AMNESIA AND ANALGESIA

Collective Review

LOWELL F BUSHNELL, A B, M D, Highland Park, Illinois

THE relief of labor pains has interested the men of medicine since the beginning. The Egyptians have shown by inscriptions and drawings that crude methods were in vogue to relieve the sharp agonizing pains of childbirth. During the Renaissance certain drugs, when brewed, caused vapors to permeate the room and aided the patient suggestively.

Sir James Young Simpson, of Edinburgh, first used an anesthetic for this purpose in 1847, and comments "Three hours and a half after they (the labor pains) commenced I placed her under the influence of chloroform. The child was expelled in about twenty-five minutes after the inhalation was begun. The squall of the child did not, as usual, rouse her, and some minutes elapsed after the child was removed by the nurse into another room, before the patient awoke. She then turned around and observed to me that she had 'enjoyed' a very comfortable sleep, and indeed required it, as she was so tired, but could now be more able for the work before her. In a little time she again remarked that she was afraid her 'sleep had stopped the pains.' Shortly afterward her infant was brought in by the nurse from the adjoining room, and it was a matter of no small difficulty to convince the astonished mother that the labor was entirely over and that the child presented to her was really her 'own living baby.'"

With the advent of the active use of ether, it was used as an analgetic and an anesthetic during labor. Then Kikowitsch of St Petersburg, in 1880, and Winchel of Dresden, in 1881, used nitrous oxide for this purpose. This procedure was thoroughly popularized by Webster and Lynch (240), and Davis (52) at the Presbyterian Hospital in Chicago, and by Guedel (84) in Indianapolis.

Even spinal anesthesia, shortly after its introduction in 1889 for surgical use, was attempted in obstetrics by Sinclair, Hopkins, and others.

Abridgment of thesis submitted to the Faculty of the Graduate School of Medicine of the University of Pennsylvania in partial fulfillment of the requirements for the degree of Master of Medical Science for graduate work in obstetrics.

It was not until the early part of the twentieth century that Steinbuechel (219) first, and later Gauss (73), suggested the use of morphine and scopolamine for alleviating the pangs of parturition. Much experimental work has been carried on in regard to this method, with varying conclusions, for the combined use of morphine and scopolamine showed unfortunate results at times in the hands of certain inexperienced, as well as experienced, obstetricians.

In 1913, George B. Wallace of the then New York University and Bellevue Medical College experimented with the use of ether-oil rectal anesthesia. His findings were applied to clinical practice in the Lying-In Hospital of New York by Davis (50) and Gwathmey (90, 92) in the early 1920's and became the basis of the accepted method of obstetrical analgesia for the next few years.

In 1904, Fischer and Dilthey discovered barbituric acid and compounded some early derivatives. Two decades later, after pharmacologists had produced an increasing number of these barbituric-acid products, their use was attempted in obstetrics. J. C. Hirst and others were the first clinicians who thoughtfully studied the actions of the barbiturates in obstetrics. They worked with sodium amylal and reported their results in 30 cases in 1929. Vogt and Kautz (108) also reported on the obstetrical use of pernocton in 1929, and Swendson (223) reported on the use of sodium amylal in December, 1930. Many additional authors in the past seven years have reported on the use of the barbiturates, alone and in combinations, for the relief of childbirth pains. Irving, Berman, and Nelson (101), in the early part of the fourth decade of this century, produced in all probability the most comprehensive evaluation of the present methods of obstetrical amnesia and analgesia. They concluded that pentobarbital sodium and scopolamine gave the best results.

THE PROBLEM

Because of the increased number of men using obstetrical amnesia or analgesia in its various forms, it has seemed worth while to decide defi-

nately the trend of this subject. Therefore, a questionnaire was sent to 93 outstanding obstetricians, so scattered throughout the United States that it would be possible to deduce this trend. Seventy-three completed questionnaires were returned. Each was divided into two distinct parts. The first asked for a description of the drugs in use, their route of administration, the indication for initial medication, and the dosage. The second asked a series of questions on the results obtained. The obstetrical profession is composed of men who consider this problem seriously, for many differences of opinion as to what method is best, with the least amount of untoward effects, were expressed.

In a digest of the answers to Part I, it was found that the idea of polypharmacy permeates, for many men use not only a hypnotic but also an amnesiac to produce the desired results, most of them include an anesthetic. Pentobarbital sodium, either alone or in combination with other drugs, seems to have the greatest number of advocates. Rectal ether oil is still popular either in the accepted modified Gwathmey technique or as an inhibitor of the barbiturate excitement. Sodium (10-amy) ethyl barbiturate (sodium amytal) also has some advocates, as well as the newer barbituric acid derivatives. Chloroform is still used. Ethylene and oxygen are used by a great number for analgesia and anesthesia, as is nitrous oxide and oxygen. Cyclopropane is recommended for obstetrical use by one correspondent while paraldehyde alone and in combinations has a large number of adherents. One clinic uses heroin, and 3 use spinal anesthesia. Local anesthesia is used in 7 institutions. The majority use more than one type of obstetrical sedation as indicated.

This study of the questionnaires shows variations of results from the great number of methods used. A few of the comments are interesting. From one clinic where morphine and ethylene are used comes this comment: "We do not believe that it is advisable to attempt to give women completely painless labor—reasonable analgesia is good, but heavy doses of narcotics are not popular." From another which uses heroin and nitrous oxide comes: "Most of us still feel that all of the various analgesics which we have used with exception of heroin have occasionally had an unfavorable effect upon the baby and hence the clinic has not seen fit to adopt any of these modern techniques as clinic routine." The comment from one of the greatest obstetrical authorities in the United States is: "I feel that the trend in producing obstetrical analgesia has exceeded the limits of safety in many places. The routine ad-

ministration of any particular drug or combination of drugs impresses me as an unfortunate thing. While relief of labor pains may indicate the use of analgesic preparations I feel that the cases are not sufficiently individualized in many instances. The depressing effect of these drugs in prolonging labor may account for the constantly increased recourse to operative deliveries. In the hands of experts this may not prove such a serious matter, but such teaching disseminated through the profession undoubtedly leads to bad results." Another man who used morphine and scopolamine with ethylene, says: "Analgesia in labor should be used only by an experienced man." Another authority states: "We have not found an ideal analgesia and are still trying various methods and combinations." Another comments: "We do not have a routine. Each case is individualized. This is the secret of success in the use of analgesia. There is a great individual variation to dosage particularly with scopolamine. I feel that the ideal method of painless labor and delivery has not yet been discovered. Careful individualization of cases and dosage is of first importance. Attendance of the obstetrician is necessary for satisfactory results." A thought-producing comment is: "I feel that the use of amnesia and analgesia is a great help to the mother and indirectly to the fetus but should be given only by those trained in obstetrics and that the labor when under the influence of drugs should always be supervised by the obstetrician or a capable assistant and not left to the nursing staff alone." Another is: "I consider the present trend of complete analgesia and routine operative deliveries as dangerous to both mother and child. The big fault is that it is not objective medicine, but is based as I have seen it, on the complaints of the patient." Another opinion reads: "No routine can be established for women in labor. In fact the same woman should be handled differently in her own successive labors." And a like comment reads: "It must be distinctly understood that each case is a law unto itself and must be treated accordingly." Another well recognized obstetrician says: "Analgesia and amnesia, I believe are perfectly safe when carried out by competent obstetricians in a well regulated hospital with a personnel who is thoroughly familiar with the procedure." Another authority comments: "Sedutal and scopolamine have given me better results than anything I have used. The restlessness of the patients worries me for fear of injury during analgesia. What we need is a safe drug which will do away with subconscious registration of pain." And a similar comment says: "Confidence gained

in the time taken to explain labor to the patient even going into details gives better results in the administration of the medication. Absence of fear plays a great part in success of the use of the drug."

From the comments elicited it is evident that many obstetricians are seriously considering the subject of analgesia and amnesia in labor, and for this reason it has seemed advisable to include in this paper a summary of the methods at present in vogue

DISCUSSION OF METHODS

The questionnaires have shown that pentobarbital sodium is the most popular of the barbiturates in use. It is used either alone, in the modified Gwathmey technique, in combination with paraldehyde, with scopolamine, as a preliminary for spinal or local anesthesia, in conjunction with morphine, or as a preliminary to the use of intravenous sodium ethyl-(1-methyl-butyl) thiobarbiturate (sodium pentothal). A discussion of it alone is indicated, for no obstetrician should attempt to use any drug for analgesia and amnesia unless he fully understands its properties, just as no mechanic should attempt to use a tool if the results of its action are unknown to him. Experience has shown us that certain of the barbiturates are far more than simple hypnotics, some have been found efficient as rapid-acting surgical anesthetics, and others are profound sedatives capable of producing in proper dosage, not so much a deep sleep, as a state of amnesia. The barbiturate under discussion probably has great amnesiac power and fair sedative or analgesic power.

Pentobarbital sodium is one of the derivatives of barbituric acid which seems to have essentially two times the toxicity of barbital, 5 1/2 times its efficiency, and 2 1/2 times its safety, which is secured by dividing the efficiency by the toxicity. Its action seems to be fairly rapid as compared with that of barbital, which might be explained on the basis of the higher distribution coefficient of the ethyl (1-methyl-butyl) barbituric acid, which would aid in rapid transfer of the drug from the stomach or intestine to the nerve and brain centers. The duration of its action is about one-sixth that of barbital. It is evident from the pharmacological literature that this barbiturate is destroyed in the body, for the most part in the liver, and is not eliminated through the kidneys, as is phenobarbital and barbital. For this reason, induced diuresis can in no way influence the duration of its activity. Fitch, Waters, and Tatum (67) described this drug as possessing to an unusual degree "sedative and antispasmodic"

properties. It has no effect on the metabolism except as the patient herself, by marked sedation or increased activity from subconscious reaction to painful stimuli, might lower or raise her oxygen consumption. There seems to be no increase in the blood sugar, which rarely exceeds normal limits. A fall in the blood pressure has been a fairly constant finding, probably because the barbiturates in general cause some peripheral vasodilatation. There is a definite fall in the calcium content of the blood, which is probably due to the depression of respiration and an increase in carbon dioxide tension. There is some depression of the respiratory center in that the excursions become more shallow, and, as has been shown pharmacologically, death may be produced by respiratory paralysis or pulmonary edema from overdosage. There seems to be no appreciable change in the pulse rate. The urinary output is decreased, probably because of the decreased blood pressure. There does not seem to be any evidence that there is an impairment of glomerular activity. No definite effect on the hepatic function has ever been demonstrated. Some men maintain that this particular barbiturate has some effect on the gastro-intestinal tract in decreasing the amount of nausea and vomiting during surgical or obstetrical operations. Small doses of this barbiturate usually increase the deep reflexes, while both deep and superficial reflexes are diminished or entirely abolished under larger doses. The threshold for painful stimuli is increased, and obstetrical patients are known to show an unconscious registration to painful stimuli. Pentosodium has a certain psychological effect in that it removes apprehension and fear, and patients under its influence are usually quite cheerful. Toxic symptoms may result from an idiosyncrasy to the drug. The pathological changes after lethal doses have been described as a considerable congestion of the capillaries of the brain and meninges with some perivascular hemorrhage and edema. The lungs are congested and may show inflammatory changes, the tubules of the kidney are hemorrhagic, and the liver shows evidence of fatty degeneration. The antidote for an overdose is picrotoxin, which counteracts the barbiturate, and a respiratory stimulant to maintain respiratory activity. The barbiturates do not produce a leucopenia. Hirst and others have shown that iso-amyl-ethyl barbituric acid has no effect on uterine contractions, but clinical experience seems to indicate that all the barbiturates will increase the interval between the contractions for a few hours, within thirty minutes after their administration, after which the interval becomes

progressively shorter to deliver. It seems to have no effect upon the life of the fetus *in utero*, or upon the life of the newborn infant. Dille reports that in animal experimentation both barbitol and amylal are found in the fetuses of drugged mothers. His maternal dosage, however, approached the lethal state. While no experimental work has been done with the barbiturate under discussion in this respect, one wonders whether the accepted dosage is great enough to show transmission through the placenta into the fetal blood stream and whether or not if any of this barbiturate is transmitted the concentration is enough to produce the occasional "drowsy" baby spoken of in the great number of reports. There is an occasional patient who is likely to show an idiosyncratic dermatosis as well as other types of idiosyncratic reactions. Therefore, it has been suggested that every pregnant patient who is a candidate for analgesia and amnesia be tested during her prenatal period. Clinical experience seems to indicate that body weight should be considered in reckoning the dosage but that weight due to fat alone should be adequately discounted. Temperament also plays a certain part, in that the thin nervous type of woman will probably need larger doses for an adequate response. Experience also seems to indicate that the efficiency obtained is directly proportional to the intelligence quotient. The toxic patient with possible liver damage will have a reduced power of elimination and therefore will probably need smaller doses. Patients with hyperthyroid tendencies will probably need larger doses. Fear of impending events also indicates larger doses.

It seems worth while to outline briefly the routines in use at the present time by the greatest number of advocates of this drug. The first routine to be discussed is that of the combination of pentobarbital sodium and scopolamine. Most authorities agree that during labor the action of the digestive system is inhibited. Therefore the patient should be cautioned to eat frequent small meals when labor is imminent and to abstain completely from eating solid food after regular contractions have begun because food in the stomach probably acts as a barrier to the efficient and rapid absorption of the drug. Indications for initial dosage have varied with the obstetricians. Some use the patient's own subjective reaction to pain, some the duration and frequency of contractions, some the stage of dilatation of the cervix and others the fact that the cervix is showing progressive changes in effacement and/or dilatation. The dosage most commonly used is between 4½ and 9 gr and depends upon the

patient's weight. It is accompanied by a single dose of scopolamine ranging from 1/60 to 1/100 gr. The barbiturate is usually given by mouth and the scopolamine subcutaneously, but some men have used the rectal route in nauseated or vomiting patients. It is agreed that the patient should until she reacts postdelivery, be under the constant protective care of an experienced attendant who in no way disturbs or restrains her. Restlessness between contractions is the usual indication for additional dosage, usually by rectal insertion of a perforated capsule. Most of the reports indicate that the majority of the infants show no reaction to the drug, but many mention an occasional "sleepy baby." Clifford and Irving (41) summarize, "Neither pentobarbital sodium amylal scopolamine rectal ether, nor paraldehyde could be held responsible for the symptoms of asphyxia that were encountered in some of the newborn infants." It is our belief that the untoward effects of analgesia may well be explained by nitrous oxide oxygen mixtures above the 85-15 level producing a degree of fetal asphyxia dependent upon the duration of the exposure and the size of the infant."

The instance of complete amnesia is reported to be from 60 to 93 per cent. and of partial from 7 to 24 per cent. and of failures from 3 to 16 per cent. The consensus of opinion is that labor is usually accelerated for what reason it is hard to decide definitely. Some say that there is a relaxing activity on the cervical musculature and the perineal floor. Others maintain that there is a relaxation of the voluntary abdominal muscles which at the time of a contraction in parturients who have received no sedative are usually unconsciously contracted which prevents the uterine contractions from fully expending themselves in cervical dilatation. Some believe that the incidence of cervical tears is lessened while others say there is no change. It is possible that this suggested decrease in cervical damage might result from the fact that the patient has been allowed to progress fully into the second stage without conscious pain and therefore has no inherent desire to "push down" before complete dilatation has taken place. Some believe that post partum hemorrhage has been decreased with this type of analgesia and amnesia. Others see no change, while others have suggested that post partum hemorrhage is increased. Those men who believe that post partum hemorrhage is decreased describe the uterus as a bundle of muscle which must have a period of rest following a contraction so that the end products of muscular contraction i.e., carbon dioxide and lactic acid may

be removed. Therefore, the patient who has received no sedative may "maul" her own uterus by aberrant abdominal-muscle contractions, by continually stimulating the uterine muscle and allowing no time for rest, and finally after delivery, cause a state of fatigue relaxation in these muscle groups.

The advocates of this combination in most instances frown upon the use of morphine in conjunction, because of its respiratory-depressing activity, which is similar to that of the barbiturate. They use scopolamine to enhance the amnesia. Most are agreed that this method is contra-indicated in patients who are poor anesthetic risks, who have acute liver damage or heart disease, and who show any pulmonary or upper respiratory pathology. The majority believe that the method is contra-indicated in home obstetrics. It is generally accepted that the operative incidence, chiefly that of outlet or prophylactic forceps deliveries, is increased, probably because of the diminished co-ordination of the patient, which is required for the expulsive effort necessary to complete the delivery. A certain number of men have used ether in oil by rectal instillation to control the delirious excitement of some patients, while others have felt that morphine was worth while. An occasional individual has suggested sub-emetic doses of apomorphine for the same purpose. The duration of the post-delivery sleep has been treated differently by various of the advocates, some believe that it is beneficial to the patient, and others attempt to awaken the patient within a few hours after delivery. Most of the advocates of this method believe that inhalation anesthesia, nitrous oxide, ethylene, and/or ether should be administered before the patient is draped for delivery. The failures which have been recorded in this method are ascribed to one of the following reasons: insufficient dosage, either because of the small amount given or because of poor absorption due to a full stomach, because of pains or fear so severe that there was not enough blood throughout the splanchnic area to carry on normal absorption, or because the nervous system was naturally "resistant" to this particular drug. An occasional case of persistent amnesia has been recorded, but this is so rare that most men have disregarded this untoward effect, which is probably due to the action of scopolamine. The discussion of maternal and fetal mortality will follow later.

Another popular routine for obstetrical amnesia and analgesia is the use of paraldehyde given rectally or orally in combination with

benzyl alcohol, ether, sodium pentobarbital, morphine, or sodium iso-amyl-ethyl barbituric acid (sodium amytal). Colvin and Bartholomew (42), Rosenfield and Davidoff (198), Kane and Roth (200), Moore and McCurdy (169), Douglass and Peyton (61), Conn and Vant (44), DeCosta and Reis (54), all reported on the use of paraldehyde in some combination for obstetrical amnesia and analgesia during labor. Their findings with the use of paraldehyde as a basic amnesiac agent seem to show essentially like results as the above routine, with the additional facts that their instance of complete amnesia is reported as being higher and that restlessness is to some extent reduced. Inasmuch as the greatest number of questionnaires reported the combination of paraldehyde and pentobarbital sodium, it seems only fair to say that one must remember that the paraldehyde replaces the scopolamine in the previous discussion, and does not seem to increase uterine inertia, the duration of labor, the incidence of forceps, fetal apnea, post-partum hemorrhage, or fetal or maternal morbidity or mortality to any marked degree over their incidence in conjunction with the afore-mentioned technique. The one questionable feature of this routine has been the necessity of the administration of paraldehyde by rectum, for it is difficult for many individuals to adequately master the technique of the maintenance of this rectal instillation. The addition of benzyl alcohol as a rectal mucosal topical anesthetic has helped to counteract this drawback. However, paraldehyde is still a drug with a most disagreeable odor, highly objectionable on the patient's breath for many hours after delivery. The recent suggestion of giving paraldehyde by mouth mixed with propylene glycol, alcohol, and syrup of acacia, or with equal volumes of chilled almond oil and orange juice has somewhat answered the objection to rectal instillation. It seems that the authors reporting have had good results with this routine.

Mention has been made previously in this paper of the Gwathmey technique with ether-oil, quinine, and the synergistic action of magnesium sulfate with both these and morphine. We mention it here again because the advocates of the routine have discarded magnesium sulfate, substituting pentobarbital sodium. They have also added paraldehyde to their ether-oil rectal instillation. Pentobarbital sodium has been administered mainly for its amnesiac action. Excellent results are reported with the use of this combination. The incidence of complete amnesia and analgesia is reported as greater than that with pentobarbital and scopolamine, the restless-

progressively shorter to delivery. It seems to have no effect upon the life of the fetus *in utero* or upon the life of the newborn infant. Dille reports that in animal experimentation, both barbitol and amytal are found in the fetuses of drugged mothers. His maternal dosage, however approached the lethal state. While no experimental work has been done with the barbiturate under discussion in this respect one wonders whether the accepted dosage is great enough to show transmission through the placenta into the fetal blood stream, and whether or not, if any of this barbiturate is transmitted the concentration is enough to produce the occasional "drowsy" baby spoken of in the great number of reports. There is an occasional patient who is likely to show an idiosyncratic dermatosis as well as other types of idiosyncratic reactions. Therefore, it has been suggested that every pregnant patient who is a candidate for analgesia and amnesia be tested during her prenatal period. Clinical experience seems to indicate that body weight should be considered in reckoning the dosage, but that weight due to fat alone should be adequately discounted. Temperament also plays a certain part, in that the thin nervous type of woman will probably need larger doses for an adequate response. Experience also seems to indicate that the efficiency obtained is directly proportional to the intelligence quotient. The toxic patient with possible liver damage will have a reduced power of elimination and therefore will probably need smaller doses. Patients with hyperthyroid tendencies will probably need larger doses. Fear of impending events also indicates larger doses.

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patient's weight. It is accompanied by a single dose of scopolamine, ranging from 1/100 to 1/100 gr. The barbiturate is usually given by mouth and the scopolamine subcutaneously, but some men have used the rectal route in nauseated or vomiting patients. It is agreed that the patient should until she reacts postdelivery, be under the constant protective care of an experienced attendant who in no way disturbs or restrains her. Restlessness between contractions is the usual indication for additional dosage, usually by rectal insertion of a perforated capsule. Most of the reports indicate that the majority of the infants show no reaction to the drug but many mention an occasional "sleepy baby." Clifford and Irving (41) summarize, "Neither pentobarbital sodium amytal scopolamine rectal ether, nor paraldehyde could be held responsible for the symptoms of asphyxia that were encountered in some of the newborn infants. It is our belief that the untoward effects of analgesia may well be explained by nitrous oxide oxygen mixtures above the 85-15 level producing a degree of fetal asphyxia dependent upon the duration of the exposure and the size of the infant."

The instance of complete amnesia is reported to be from 60 to 93 per cent, and of partial from 7 to 24 per cent and of failures from 3 to 16 per cent. The consensus of opinion is that labor is usually accelerated for what reason it is hard to decide definitely. Some say that there is a relaxing activity on the cervical musculature and the perineal floor. Others maintain that there is a relaxation of the voluntary abdominal muscles which at the time of a contraction in parturient's who have received no sedative are usually or consciously contracted which prevents the uterine contractions from fully expending themselves in cervical dilatation. Some believe that the incidence of cervical tears is lessened while others say there is no change. It is possible that this suggested decrease in cervical damage might result from the fact that the patient has been allowed to progress fully into the second stage without conscious pain, and therefore has no inherent desire to push down before complete dilatation has taken place. Some believe that post partum hemorrhage has been decreased with this type of analgesia and amnesia others see no change while others have suggested that post partum hemorrhage is increased. Those men who believe that post partum hemorrhage is decreased describe the uterus as a bundle of muscle which must have a period of rest following a contraction, so that the end products of muscular contraction i.e. carbon dioxide and lactic acid may

be removed. Therefore, the patient who has received no sedative may "maul" her own uterus by aberrant abdominal-muscle contractions, by continually stimulating the uterine muscle and allowing no time for rest, and finally after delivery, cause a state of fatigue relaxation in these muscle groups.

The advocates of this combination in most instances frown upon the use of morphine in conjunction, because of its respiratory-depressing activity, which is similar to that of the barbiturate. They use scopolamine to enhance the amnesia. Most are agreed that this method is contra-indicated in patients who are poor anesthetic risks, who have acute liver damage or heart disease, and who show any pulmonary or upper respiratory pathology. The majority believe that the method is contra-indicated in home obstetrics. It is generally accepted that the operative incidence, chiefly that of outlet or prophylactic forceps deliveries, is increased, probably because of the diminished co-ordination of the patient, which is required for the expulsive effort necessary to complete the delivery. A certain number of men have used ether in oil by rectal instillation to control the delirious excitement of some patients, while others have felt that morphine was worth while. An occasional individual has suggested sub-emetic doses of apomorphine for the same purpose. The duration of the post-delivery sleep has been treated differently by various of the advocates, some believe that it is beneficial to the patient, and others attempt to awaken the patient within a few hours after delivery. Most of the advocates of this method believe that inhalation anesthesia, nitrous oxide, ethylene, and/or ether should be administered before the patient is draped for delivery. The failures which have been recorded in this method are ascribed to one of the following reasons: insufficient dosage, either because of the small amount given or because of poor absorption due to a full stomach, because of pains or fear so severe that there was not enough blood throughout the splanchnic area to carry on normal absorption, or because the nervous system was naturally "resistant" to this particular drug. An occasional case of persistent amnesia has been recorded, but this is so rare that most men have disregarded this untoward effect, which is probably due to the action of scopolamine. The discussion of maternal and fetal mortality will follow later.

Another popular routine for obstetrical amnesia and analgesia is the use of paraldehyde given rectally or orally in combination with

benzyl alcohol, ether, sodium pentobarbital, morphine, or sodium iso-amyl-ethyl barbituric acid (sodium amytal). Colvin and Bartholomew (42), Rosenfield and Davidoff (198), Kane and Roth (200), Moore and McCurdy (169), Douglass and Peyton (61), Conn and Vant (44), DeCosta and Reis (54), all reported on the use of paraldehyde in some combination for obstetrical amnesia and analgesia during labor. Their findings with the use of paraldehyde as a basic amnesiac agent seem to show essentially like results as the above routine, with the additional facts that their instance of complete amnesia is reported as being higher and that restlessness is to some extent reduced. Inasmuch as the greatest number of questionnaires reported the combination of paraldehyde and pentobarbital sodium, it seems only fair to say that one must remember that the paraldehyde replaces the scopolamine in the previous discussion, and does not seem to increase uterine inertia, the duration of labor, the incidence of forceps, fetal apnea, post-partum hemorrhage, or fetal or maternal morbidity or mortality to any marked degree over their incidence in conjunction with the afore-mentioned technique. The one questionable feature of this routine has been the necessity of the administration of paraldehyde by rectum, for it is difficult for many individuals to adequately master the technique of the maintenance of this rectal instillation. The addition of benzyl alcohol as a rectal mucosal topical anesthetic has helped to counteract this drawback. However, paraldehyde is still a drug with a most disagreeable odor, highly objectionable on the patient's breath for many hours after delivery. The recent suggestion of giving paraldehyde by mouth mixed with propylene glycol, alcohol, and syrup of acacia, or with equal volumes of chilled almond oil and orange juice has somewhat answered the objection to rectal instillation. It seems that the authors reporting have had good results with this routine.

Mention has been made previously in this paper of the Gwathmey technique with ether-oil, quinine, and the synergistic action of magnesium sulfate with both these and morphine. We mention it here again because the advocates of the routine have discarded magnesium sulfate, substituting pentobarbital sodium. They have also added paraldehyde to their ether-oil rectal instillation. Pentobarbital sodium has been administered mainly for its amnesiac action. Excellent results are reported with the use of this combination. The incidence of complete amnesia and analgesia is reported as greater than that with pentobarbital and scopolamine, the restless-

progressively shorter to delivery. It seems to have no effect upon the life of the fetus *in utero*, or upon the life of the newborn infant. Dille reports that in animal experimentation, both barbitals and amylal are found in the fetuses of drugged mothers. His maternal dosage however, approached the lethal state. While no experimental work has been done with the barbiturate under discussion in this respect, one wonders whether the accepted dosage is great enough to show transmission through the placenta into the fetal blood stream and whether or not if any of this barbiturate is transmitted the concentration is enough to produce the occasional "drowsy" baby spoken of in the great number of reports. There is an occasional patient who is likely to show an idiosyncratic dermatosis as well as other types of idiosyncratic reactions. Therefore it has been suggested that every pregnant patient who is a candidate for analgesia and amnesia be tested during her prenatal period. Clinical experience seems to indicate that body weight should be considered in reckoning the dosage but that weight due to fat alone should be adequately discounted. Temperament also plays a certain part in that the thin nervous type of woman will probably need larger doses for an adequate response. Experience also seems to indicate that the efficiency obtained is directly proportional to the intelligence quotient. The toxic patient with possible liver damage will have a reduced power of elimination and therefore will probably need smaller doses. Patients with hyperthyroid tendencies will probably need larger doses. Fear of impending events also indicates larger doses.

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ANALGESIA CHART DEvised BY JOHN COOKE HIRST FOR USE IN THE MATERNITY
HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA

LABOR	ADMISSION TO LABOR ROOM		Date		a m p m		CONDITION	
	a m p m	BIRTH	Date	a m p m	MEMBRANES	Date	a m p m	
ONSET Date	a m p m	BIRTH	Date	a m p m	MEMBRANES	Date	a m p m	
SECOND STAGE Date	a m p m	PLACENTA	Date	a m p m	POSITION			
TIME								
DRUGS								
PAINS Duration Frequency								
SLEEP								
RESTLESS								
VAG DISCH								
B P								
PULSE								
POSITION								
I H S								
PREL PART								
EFFACEMENT								
DILATATION								
STATION -1 to +3								
SIGNALD								
DURATION	Length of 1st Stage	hrs min	Length of 2d Stage	hrs min	Length of 3rd Stage	hrs min	Total Length of Labor	hrs min

In closing, the following comments of elder authorities are interesting. Davis in 1916 wrote "The belief that pain is an inevitable accompaniment of labor has reconciled mothers to endure it, while the joy of successful motherhood has caused them to forget it. There is, however, no logical reason why women should suffer during labor." Another has said "It must always be a secondary consideration. It cannot be expected that the obstetrician who adopts the methods of the new school will endear himself to the hearts of his patients as did the physician of the old school, who sat by his patient through the intense suffering, having as his chief armament patience and encouragement, and who, only as a last resort, delivered the baby and ended the ordeal. Appreciation comes mainly by contrast, and prophylaxis never impresses the patient's mind as much as cure. When a patient is carried through a labor in a state of practical oblivion, and really has no knowledge of what a genuine labor is like, she cannot appreciate the worth of such treatment, as does the patient who is relieved after long suffering. The obstetrician's reward must be largely his personal satisfaction in the realization that he has been able to conduct comfortable and,

at the same time, safe labors, and thereby save the women of today the tortures of our mothers." And recently Mussey has summarized well this subject with, "If relief of pain in labor is considered from a world-wide standpoint, it is evident that methods for this relief are most highly developed in those countries in which women are more nearly on a plane of political, social, and economic equality with men."

CONCLUSIONS

1. The ideal drug or combination of drugs for obstetrical amnesia and analgesia has not yet been discovered.

2. It is reported that all routines in the hands of their masters are essentially safe for both mother and baby.

3. The great variance of methods in use is a healthy sign that the obstetrical profession is studying the problems presented, which in itself gives hope of the future discovery of an ideal routine.

4. The final premise must be that such procedures, well understood by the obstetrically trained man, should be employed only when indicated.

ness as lessened and the incidence of operative deliveries as the same or decreased, in fact, some maintain that this incidence is decreased below that of any other routine. There are no major physical contra indications; there are no effects on the baby; the mental and physical shock is lessened; the normal appetite is restored within a few hours after delivery, and the method is relatively inexpensive. Another innovation is the addition of allyl isopropyl barbituric acid (acid alurate) in the rectal ether oil mixture. However, the advocates of other routines still maintain that the difficulty of rectal administration is a real objection.

A few men use procaine either with or without epinephrine as a means of locally anesthetizing the perineum at the time of delivery. Those reporting this routine have used pentobarbital sodium in small doses during labor. This is reported as being a 'natural' combination because of the antidotal action of the barbiturates to procaine, particularly the shorter acting barbiturates such as pentobarbital sodium. Those reporting this procedure have noticed increased relaxation of the perineum, no diminution in the reparative and healing power of the local tissue, and no increase in perineal infection. They particularly advocate it for all types of complicating heart conditions, acute respiratory infection, or any impairment of the vital organs where other forms of amnesia, analgesia and anesthesia are contra indicated. If this method of local anesthesia combined with pentobarbital sodium, analgesia and amnesia, one must remember the actions of both drugs.

A few reported on the use of sacral block anesthesia for occasional cases with or without the use of other amnesiacs or analgesics during the course of labor. This routine is well known and has its indications.

No questionnaire reported the use of sodium ethyl (1 methyl butyl) thiobarbiturate (sodium pentothal), but this paper would be incomplete without the notation that Solomons of the Rotunda Hospital in Dublin has recently published a report in which he concludes: "Our observations have led us to believe that in obstetrical practice, with care and a little experience, pentothal sodium given intravenously is a safe anesthetic for both mother and child and is suitable in either hospital or private practice."

No discussion has been made of sodium amylal because its action is essentially that of a longer acting barbiturate. Alurate dial, and others are not discussed for the same reason. No one reported the use of sigmoidal or secoral, which is

also a shorter acting barbiturate, and the vinyl ether was not mentioned in any of the returned questionnaires.

One suggested addition to the armamentarium of the obstetrician using these methods of amnesia and analgesia is an analgesia chart which was originated by J. C. Hirst at the University of Pennsylvania Maternity Hospital and which is now being used in a modified form at the Philadelphia Living in Hospital and the Preston Retreat.

Opponents of the use of obstetrical amnesia and analgesia offer the following objections: (1) the prophylactic use of outlet forceps is condemned; (2) all drugs reduce uterine contractions both in frequency and in strength and thus interfere with normal uterine function; (3) the essential co-operation of the mother during the second stage is lost, and thus an arrest of labor is produced; (4) the change in the uterine activity predisposes to hemorrhage in the third stage; (5) patients who are afraid before an operation often suffer from shock which probably is the result of damage to the cells of the higher nerve centers transmitted by afferent impulses from the trauma and even deep surgical anesthesia cannot overcome the influence of this emotion; (6) all analgesics have a depressing effect on the respiratory center of the fetus; (7) easy spontaneous delivery is a preventive of birth trauma which might cause neuroses in later life; (8) childbearing is an essential experience to a woman, which should not be thwarted in its normal course because of the damage to her personality; (9) no woman, whether intelligent or unintelligent, modern or old-fashioned, wants the birth of her baby to be a blank in her memory.

A discussion has recently been published regarding the bad effects of certain of the methods used in obstetrical amnesia and analgesia. The author shows that a certain number of maternal deaths are attributable to the invidious use of drugs. This writer thoroughly agrees with this author in that such maternal deaths probably were due to certain of these drugs as well as other anesthetics, but in his study of individual cases in which the drugs have been the primary or even the contributing cause, they were in almost every instance used in poorly selected cases and without proper consideration by the attending obstetrician. As declared previously in the paper, success with obstetrical amnesia and analgesia can be obtained only by the individual trained both in the pharmacology of his drugs and in his obstetrical knowledge of the patient herself.

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OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

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In view of the significance of the hypertension to an early diagnosis of a developing nephropathy of pregnancy, the author, in order to obtain comparable values, examined the material according to the same method which was described by Simon in *Acta obst. et gynec. Scand.* in 1931. As his final result Simon *inter alia* found an increase in the blood pressure in one-fourth of the cases as the first symptom of pregnancy toxicosis. The usual symptoms are an increase in the albumin, edema, and the blood pressure. In accordance with this the author observed an increase of both the systolic and the diastolic blood pressure in about two-fifths of the cases presenting toxicosis as the first symptom, or before the demonstration of albumin in the urine. This increase was sometimes quite considerable and was observed from two weeks up to more than two months before the presence of albumin in the urine. The author,

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OBSTETRICS

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The authors' experience with this method has been so favorable that its use has been extended from their ward to their private practice. There have been no complications or untoward sequelae in 2,000 cases in which this method was used.

M. M. ZAVAGAS, M.D.

Costa, A. Rupture of the Uterus during Labor (As rupturas do utero durante o trabalho). *Folha Med.* 1935 19 28 37 49.

Costa observed during a period of five years 20 cases of rupture of the uterus during the second stage of labor. This number occurred in a series including 1,647 cases of labor, the incidence being approximately 1.2 per cent.

In the author's opinion this relatively high incidence is to be attributed to the increasing number of admissions to the maternity hospitals during the last few years. It is probable that the total incidence is still higher if one considers that individuals of the poorer classes generally do not receive adequate prenatal care and usually call in the physician when it is too late.

Among Mohammedan women the incidence of rupture of the uterus during labor is 1.8 per cent as reported by the Maternity Hospitals in Algiers and this is not to be attributed to a poor obstetrical technique but rather to the refractory attitude of the patient toward prenatal care.

Concerning the pathogenetic mechanism of this condition the author believes that the inferior segment of the uterus represents the most dangerous zone as already several other authors have pointed out. Hydramnios and twin pregnancy are obviously important predisposing factors.

Other predisposing factors are: (1) degenerative changes of the uterus due to a chronic endometritis or to infectious diseases such as syphilis and tuberculous (in albuminuric cases the friability of the uterus is increased especially), (2) malignant tumors, (3) mechanical obstruction, (4) uterine curettage followed by loss of substance and weakening of the uterine wall or the formation of scars.

Concerning the site and direction of the rupture, the following distribution was observed in the author's series: anterior transverse rupture in 5 cases; anterior transverse combined with left longitudinal rupture in 2; left longitudinal rupture in 6; left longitudinal rupture with partial posterior colporrhesis in 1; right longitudinal rupture in 3; right longitudinal rupture extending to the fundus in 1; and right longitudinal rupture with partial anterior colporrhesis in 1.

With reference to the cause the author emphasizes factors such as: (1) multiparity, probably due to progressive retrogressive changes leading to an increased uterine friability, (2) obstacles along the fetal passages through the birth canal (inadequate pelvic diameters, pelvic malformations, hydrocephalus or any other disproportion between the fetal and the maternal parts), (3) tumors especially fibromyomas and ovarian cysts, (4) malpresentation

especially transverse presentations with prolapse of an arm, (5) pendulous abdomen, (6) uterine scars due to previous cesarean sections, myomectomies or previous uterine ruptures, (7) prepartum use of oxytocic principles especially pituitrin (a few cases of rupture of the uterus are reported following the indiscriminate use of this oxytocic principle) and (8) obstetrical trauma, especially during forceps application and version. Spinal anesthesia has also been incriminated as being a predisposing agent to uterine rupture. Following spinal anesthesia the uterus is deprived of its medullary innervation and the impulses of the autonomic nervous system are sufficiently strong to produce a hypertonia which may lead to rupture of the organ.

Concerning the symptom of rupture of the uterus the author states that rupture is not always accompanied by the dramatic events as they are usually described in text books. Imminent rupture may be diagnosed by an elevation of Bandl's contraction ring which appears on inspection as a deep furrow by the board like feel of the uterine body and the tension of the round ligaments. Usually the onset is characterized by a sudden stab like pain referable to the infer or uterine segment followed rapidly by shock, hemorrhage, cyanosis and death. Alarming symptoms are a rapid imperceptible pulse, hypotension and dyspnea. The condition must be differentiated from premature detachment of the placenta and placenta previa.

The onset of uterine rupture may be also insidious and there may be no evidence of shock or hemorrhage. Various cases are on record in which rupture of the uterus occurred in the absence of any symptoms.

The prognosis is always very grave and the life of the mother and child is greatly imperiled unless a laparotomy is promptly performed. In the author's series of 20 patients 13 (65 per cent) died. Of the latter group 6 died as the result of shock, 1 died on the fourth postoperative day with the advent of a peritonitis and bronchopneumonia, 3 died on the second, third and fifth postoperative days respectively of acute peritonitis and 1 died on the twenty-ninth day as the result of a late hemorrhage. Of the entire series only 1 live child extracted by forceps, could be obtained.

Treatment is entirely prophylactic. If the rupture is imminent morphine or an antispasmodic should be administered. If this does not prove helpful the patient should be anesthetized immediately with a general anesthetic and the labor should be terminated by cesarean section. If the rupture has already occurred, immediate laparotomy is most urgent.

The operative treatment includes the administration of cardiac stimulants, intravenous glucose or, most preferably, a transfusion. The three most commonly adopted surgical procedures are: (1) picking of the uterus in cases of incomplete rupture, (2) uterine repair, and (3) hysterectomy.

RICHARD F. ZIMMER, M.D.

NEWBORN

Javert, C. T. Hemorrhagic Disease of the Newborn. *Am J Obst & Gynec*, 1938, 35 200

A study of 72 cases of hemorrhagic disease occurring in 11,303 newborn infants during the period from September, 1932, to April, 1936, inclusive, is presented. The material comprises the cases observed on the Indoor and Outdoor Services of the Woman's Clinic of the New York Hospital.

The incidence of hemorrhagic disease was 0.773 per cent in the hospital, and 0.304 per cent in the outdoor service. The parturitional factors were prolonged or severe labor, anesthesia and analgesia, and increased blood loss during the third stage of labor. Maternal debility, ante-partum complications, and age appear to have an influence. The intra-uterine origin of hemorrhagic disease is more than probable. Increased circulatory tension caused by the forces of labor may produce a separation of the capillary endothelial cells, or actual rhexis of smaller blood vessels, and thereby produce the multiple hemorrhagic lesions in the various organs, as were noted both clinically and pathologically. The multiplicity of the lesions suggests that the condition is a generalized systemic process. One-third of the infants began to bleed during the first twenty-four hours of life, only 2 began to bleed after the first week of life. Bleeding precipitated by vascular trauma probably continues when the clotting or bleeding mechanism is abnormal.

The fetal factors were immaturity and prematurity, the need for resuscitation indicating anoxemia, and prolongation of the bleeding time. The use of the mother as a blood donor is open to criticism. Sedation and rest of the bleeding organs, and the administration of intramuscular blood are important. Transfusion is indicated when these measures fail, or in the presence of anemia. The statistics on the total fetal mortality show that 2.5 per cent of

439 neonatal deaths were due to hemorrhagic disease. The fetal vessels of the placenta offer an excellent opportunity for the study of the fetal blood at the time of delivery. The same factors which cause excessive bleeding in the mothers probably predispose the infants to abnormal bleeding.

EDWARD L. CORNELL, M.D.

MISCELLANEOUS

De Lisi, G.: Investigations on the Power of Absorption of the Amnion (*Indagini sul potere assorbente dell'amnios*). *Folia demograph gynaec*, 1937, 34 589

The author gives a résumé of the literature on the subject: does the amnion have the power of absorption? Then he presents in detail a series of experiments conducted upon the rabbit to substantiate this power.

Seven pregnant rabbits at term were subjected to cannulization of the carotid artery for kymographic blood-pressure tracings, and abdominal section under morphine anesthesia. The amniotic sac of each rabbit was punctured with a small needle and injections of (1) adrenalin, (2) acetylcholine, and (3) strychnine, in various dosages, were made and the results recorded on the kymographic drum.

The results showed that the adrenalin introduced into the amniotic sac produced an elevation of the blood pressure in the maternal carotid artery, that the acetylcholine produced a diminution of the pressure, and that strychnine introduced in the same fashion produced a slight rise of the arterial pressure, then a progressive diminution, gradual decrease of the cardiac contractions, and death.

In conclusion, the results showed definitely that the 3 drugs introduced into the amniotic sac were transmitted to the maternal circulation, and proved that the amnion was permeable.

GEORGE C. FINOLA, M.D.

GENITO-URINARY SURGERY

ADRENAL KIDNEY, AND URETER

Cavina C. Prerenal Abscess (Suoi a ce o prerenale)
Arch ital di urol 1937 14 490

Cavina presents a discussion based on the recent literature of acute retroperitoneal suppurations with special reference to the roentgenological signs and the distinguishing features of prerenal foci. In reality there is at present no adequate anatomical description of the exact relationship of this type of abscess to the fascia and layers of fat. Since supuration takes the path of least resistance meticulous distinctions in the terminology of these lesions are unprofitable. Acute retroperitoneal suppuration is the most comprehensive term for surgical diagnosis and the exact site is to be determined at operation.

The author also reports a case of prerenal abscess which apparently followed acute tonsillitis in a man twenty-one years old. Roentgenograms and descending pyelography demonstrated a moderate rotation of the right kidney combined with anterior compression, slight scoliosis to the left and an absence of the outline of the psoas muscle. At operation a cavity containing about 100 c cm of streptococcus pus was found anteriorly in the perirenal cellular tissue between the renal capsule and the perirenal fascia. The roentgenograms proved very helpful in the exact localization of the abscess. Two months after recovery from the operation the patient developed subacute appendicitis, a sequece which may or may not have been significant.

The article is accompanied by roentgenograms, anatomical drawings and a bibliography.

M I Morse M D

Moratti A. Auto Exclusion of Renal Tuberculosis (Contributo allo studio della tubercolosi renale escluda)
Arch ital di urol 1938 15 65

This is a review of a rather rare condition, auto exclusion of renal tuberculosis, including detailed clinical and histological reports on 4 of the author's own cases. In this condition diagnosis is difficult because the usual semiological and laboratory findings are lacking. Frequently spontaneous cure occurs. Halle and Motz (1903) observed 18 such cases in 100 tuberculous kidneys examined at the Necker museum. In 1904 Ehrenpreis reported a case of mastic kidney with obliteration of the ureter in a thirty year old man whose illness had been developing for nine years. In 1920 Braasch reported that of 621 patients operated on for renal tuberculosis at the Mayo Clinic 9 per cent developed auto-exclusion of the renal tuberculous process. Various interesting case reports are described from the literature of Michon, Block, Bufalini and Pisani.

The author's 4 cases are described in detail and suitably illustrated with photomicrographs and

drawings. In the first of these cases there was an accumulation of caseous material and cellular detritus partly organized which caused partial exclusion of the tuberculous process. In the second there was a mechanical obliteration of a tuberculous calyx by a fibrolipomatous process. In the third case there was mechanical exclusion of the inferior calyx and in the fourth fibrolipomatous anatomical occlusion.

Koike has said that in cases of this type cure has occurred clinically and anatomically. Legueu has observed in all tuberculous kidneys partial exclusion of the tuberculous processes and has commented on 'the great tendency to cure'.

JACOB E. KLEIN M D

Mintz E. R. Renal Cancer. New England J M
1938 218 329

This study is a continuation of the excellent report of the end results on hypernephroma published by Smith in 1925. From the beginning of 1925 to the end of 1935 105 patients on whom a definite diagnosis of renal cancer was made were admitted to the Massachusetts General Hospital. This series includes only those cases in which the diagnosis was verified by the pathologist or in which a characteristic pyelogram was supported by sufficient clinical evidence.

Of these 105 patients 79 were submitted to a nephrectomy, 10 had an exploratory operation and 3 had biopsies. Twenty patients were not treated surgically. Of the patients who had nephrectomy 45 are dead, 22 are living; there are no follow up reports in 5 cases. Of the 45 dead, 37 died within the first year, 3 within the second and third years and 5 died of metastases which developed after five years. Of the 22 living patients, 7 have gone beyond the five year period, 10 have passed the fourth year and 5 are living and well without demonstrable clinical recurrence after three years.

An exploratory operation was performed on 10 patients, 4 of these died following the exploration and 6 died at home within the first six months. Of the 3 patients on whom the diagnosis was made by biopsy, 2 died, 1 three months after the biopsy and 1 six years after it. The latter case illustrates how low growing some adenocarcinomas and hypernephromas can be. No follow up is available in 1 case. All 20 of the unoperated patients died within fifteen months except 1 who lived for three years.

The histopathology of this series showed 7 Wilms' tumors in children, 5 sarcomas in adults, 1 epidermoid and 7 papillary carcinomas of the renal pelvis and 65 adenocarcinomas or hypernephromas. In the 20 unoperated cases no pathological report was available as the diagnosis of renal tumor was made from pyelograms and clinical signs and symptoms. All the children with a Wilms' tumor died within six

months after the nephrectomy. Of the 5 adults with sarcoma, 4 died within the first year, and 1 lived two years and nine months and died in diabetic coma. This patient had no demonstrable recurrence. Four of the 7 patients with a papillary carcinoma of the renal pelvis are living, six years, four years and six months, three years and three months, and fifteen months, respectively. The single patient with an epidermoid carcinoma of the renal pelvis is living after five years, and recent x-ray examination of the chest and pelvis failed to reveal any metastatic process. Among the 65 patients with an adenocarcinoma or a hypernephroma, 10 lived more than five years, but 5 of these died later of metastases.

Of the entire series, regardless of the type of lesion, 12 patients lived more than five years, and only 7 are now alive and comparatively well. Why this tremendous mortality? In the first place, inability to make an early pathological diagnosis is the *bête noire* of this disease.

It is true that renal cancer is diagnosed much earlier now than it was before the introduction of the cystoscope, yet a casual glance through the present-day literature will soon convince any skeptic that the great majority of patients with renal cancer have a fair-sized growth when first seen or operated on. It is fair to assume that the longer the duration of the neoplastic process, the greater the chance for venous and lymphatic extension.

Another factor which prevents early diagnosis and indirectly increases the mortality is the insidious nature of the disease. The number of patients with renal cancers that fall into this group is not small, and they defy the acumen of the best clinicians. They present no urinary signs or symptoms, but the diagnosis is made clinically when the disease affects other organs.

The third factor that indirectly increases the mortality rate is that we have very few, if any, early symptoms. This is of course true of practically all types of deep cancer. The classic triad of hematuria, tumor, and pain which are described in every textbook on renal cancer means very little so far as early diagnosis is concerned.

The fourth factor that tends to increase the ultimate morbidity is failure to do a radical operation when circumstances permit. A radical disease such as this requires radical treatment. Just how much this would increase the percentage of operative cures above the 10 to 25 per cent recorded in the literature is doubtful. It might, however, reduce the number of postoperative recurrences.

Removal of all the perirenal fat can and should always be done. The advisability of doing a nephroureterectomy, with or without a segmental resection of the bladder, in papillary tumors of the renal pelvis is unquestionable, but it is not always feasible, nor is it advocated by all urologists.

Other radical procedures, such as the removal of solitary metastases when found in bone and the deliberate opening of the vena cava to remove tumor plugs, have been advocated. The number of patients

who fall into these two groups is indeed small, hence radical procedure of this sort would do little to raise the number of cures. Berg in 1913 called attention to the fact that "the metastases of hypernephroma are very often single," and added that "whereas with other varieties of malignant tumor one would decline to remove either the primary or secondary tumor because the metastatic foci of disease are apt to be multiple, yet in this variety of growth we would be justified in extirpating both the primary tumor and the secondary deposit."

It is not a simple problem to say when a metastatic nodule is solitary and when it is not, but one is justified in assuming that it is solitary if a thorough x-ray examination of the rest of the bony skeleton and lungs is negative. Some of these cases of course have metastases in deep viscera not visualized by the x-rays. That single osseous metastases occur is proved by autopsy material.

Whether one should open the vena cava and remove the tumor plugs we cannot state, because of lack of experience. That it is technically possible has been proved beyond question, but whether the procedure decreases morbidity to a marked extent is doubtful. It is a fact that there are recorded in the literature many cases in which tumor plugs filled the renal vein and vena cava, at nephrectomy, and yet the patients lived for years. This most radical procedure necessitates a transperitoneal approach, one which is advocated by all competent urologists for parenchymatous tumors of the kidney and which allows a greater exposure of the operative field than is possible with a conservative operation. There are, however, many renal tumors that can be easily removed with the usual retroperitoneal approach.

The value of deep x-ray therapy in the treatment of renal cancer is at present doubtful. Perhaps when the roentgenologist is able to deliver a dose to the tumor at a greater depth without too much harm to the neighboring structures and too great a systemic effect, or, when there is better equipment, a new era in its application will open. Until then no curative effect should be expected from irradiation alone. Pre-operative irradiation of renal cancer has recently been extolled by many prominent urologists and roentgenologists. Its chief purpose is to shrink any large new growth, mainly Wilms's tumors and adenocarcinomas, so that an inoperable neoplasm can be made operable and be entirely removed.

Postoperative irradiation of the local area after nephrectomy is of questionable value. It is usually carried out in all clinics in cases where the tumor mass has not been completely removed, and in some clinics as a routine measure. It may not be amiss at the present time to state that our ideas about the value of x-ray therapy as an adjunct in the cure of renal cancer may change overnight, so to speak, with the newer developments in technique, dosage, and high-voltage.

Although failure to do radical surgery in suitable cases is an element in the reduction of the number of late cures, the very nature of the disease is by far

the largest single factor making for a high mortality. It is obvious that we see proportionately few cases of early pathological lesions. We may see them early clinically, but pathologically they have probably either invaded the venous system or extended beyond the confines of the renal parenchyma. Unquestionably, the end results would be much better in patients with renal cancer if they were treated soon after their first hematuria. Only persistent education of the laity as to the significance of urinary bleeding will add to the longevity in this group, but how about those who have had no hematuria and whose first sign of renal cancer is to be found outside the urinary tract? This group is not small by any means and its members are the victims of the well known insidiousness of renal cancer. Their situation is analogous to that of patients with cancer in other deeply situated organs. The results will be greatly improved when the diagnosis can be made in this asymptomatic period while the growth is still limited to the kidney. C. TRAVERS STEVENS, M.D.

Grieco, F. The Power of Absorption of the Ureter (Potere di assorbimento dell' uretere). *Arch. ital. di chir.* 1937, 47, 381.

The absorptive powers of the urinary tract have been studied by various authors, by numerous methods with contradictory results. These discrepancies are due in part to the unequal powers of dispersion of the various solutions used and in part to the technique of experimentation used. Such studies are justified by the obscurity of our knowledge of the pathogenesis of hydronephrosis in renal tuberculosis and other conditions which block the pyelo-ureteral tract more or less completely.

The author reviews the comparatively scant literature in this field, namely, the work of Bazy, Lewin and Goldschmidt, Macht, Vitale and Lucarelli. The author has used the approach of the last named in his experiments. He notes that when the ureter is occluded there are only two pathways available for absorption: the blood and the lymph stream. The author's studies were conducted in four groups of experiments:

1. A solution of India ink was injected into the ureter and its progress studied histologically in the surrounding tissues.

2. A bacterial emulsion of staphylococci was injected into the ureter and the time of entry into the blood was determined by taking blood cultures.

3. The minimal lethal dose of strychnine nitrate was injected into the ureter to determine the speed of absorption of the poison from the organ.

4. The ureter was linked by inducing an angulation with a silk suture and an artificial hydronephrosis.

All the above experiments were carried out on the obstructed dilated ureter. Tables are presented giving all the experimental data, also photomicrographs illustrate the ureteral changes. The author's experiments indicate that the ureter absorbs liquids in its lumen when the vascular system is maintained

intact. Thus India ink was absorbed after thirty minutes; an emulsion of the staphylococci entered the blood stream after twenty minutes and strychnine after from ten to twenty minutes (in 1 case after five minutes). Dilatation of the ureter definitely delayed absorption in all experiments. When the ureter was dilated even strychnine was not absorbed into the general circulation and could not produce its usual lethal effect. The vascular structure seems to be the most important path of absorption from the ureter. This demonstrated power of absorption from the ureter is no doubt of considerable importance in clinical infections of the pyelo-ureteral tract. JACOB E. KLEIN, M.D.

Campbell, M. F. The Dilated Ureter in Children: A Brief Consideration of Its Causes, Diagnosis and Treatment. *Am. J. Surg.* 1938, 59, 435.

Urological examination of children with persistent pyuria or persistent pain in the mid loins reveals unilateral or bilateral ureteral dilatations in about 1 in 4 cases. Peripheral obstruction is the most common cause of ureteral dilatation, yet neuromuscular disease, and even long standing infection with secondary inflammatory change in the ureteral walls are sometimes the cause. Most of the obstructive and neuromuscular lesions are congenital.

All obstructive lesions which cause ureteral dilatation are likely to produce hydronephrotic changes with variable renal damage. When the condition is unilateral and infection is absent symptoms fail to appear until the renal injury has become extreme. With bilateral involvement and in the absence of infection the renal changes may give rise to the clinical picture of chronic interstitial nephritis, yet infection may be anticipated with ureteral dilatation. For the same reason urinary stasis prevents spontaneous cure of the infection (chronic pyelitis). The persistent pyuria is regularly and mistakenly called 'chronic pyelitis' and usually resists treatment by even the newer antiseptics such as mandelic acid and sulfanilamide. The advent of acute obstruction may convert the chronic clinical picture into that of acute renal infection which if neglected may result in loss of the kidney and even death. Unrelieved bilateral ureteral dilatation from bilateral blockage or severe infravesical obstruction continued renal damage by urinary back pressure and persistent infection may end in fatal uremia or in urinary sepsis.

Ureteral dilatation is readily demonstrated by excretory or retrograde urography. In many cases of infravesical obstruction or neuromuscular disease cystographic vesico-ureteral reflux will roentgenographically outline one or both ureters. Thorough cystoscopic examination is necessary. It is also indicated in disturbances of urination in hematuria that is not due to glomerulonephritis or tumor in the presence of pain along the course of the urinary tract and in persistent hyperacute renal infection. Treatment is based on the cause and should consist of the establishment of free urinary drainage and the

eradication of infection Restoration of satisfactory renal function is far more important than mere reduction of the ureterectasia

The causes of ureteral dilatation are classified as congenital and acquired The congenital mechanical factors involving the ureters include stricture, reduplication, blind endings of the ureter, torsion, kink, cystic dilatation, diverticulum, valves, fold or vessels, and abnormal insertion of the lower ureter, including ectopia The acquired factors include traumatic or inflammatory stricture, stone, tumor (most rare), and extra-ureteral pressure from tumor, cysts, adhesions The congenital causes involving the urethra, bladder, and ureters include vesical outlet obstruction (contracture, median bar, median lobe), diverticulum, hypertrophy of the trigone, trigonal curtain obstruction, prostatic or urethral cysts, posterior urethral valves, hypertrophy of the verumontanum, stricture, polyps, phimosis, extra-urinary masses, cysts, abnormal openings, exstrophy, epispadias, hypospadias, and penile torsion Acquired causes which involve the urethra, bladder, and ureters are the same as the congenital causes plus trauma The dynamic causes (neuromuscular disease), of both the congenital and acquired forms, include atony (megalo-ureter and cord bladder) The inflammatory causes of acquired dilatation, such as with long-standing ureteral and renal infection are common

The diagnosis of ureteral stricture is best made by combined instrumental exploration and urography Through the cystoscope the catheter, which is passed up the ureter, may be grasped or withheld at the point of blockage In diagnosing a "hang," one must be extremely careful to recognize the normal ureteral narrowings, particularly in the intramural portion of the ureter and in the upper ileac region Dilatation of the ureter above the obstruction is demonstrated by retrograde urography, and ureteral stricture is not diagnosed in the absence of proximal ureterectasia If ureterospasm is not observed at the same point in serial films and it is not apparent in ureterograms made on different days, it must be ruled out in the differential diagnosis unless a local provocative lesion exists Most strictures of the lower two-thirds of the ureter are amenable to cystoscopic dilatation with bougies, but the higher the stricture in the ureter, the less likely is this method to succeed A small ureteral orifice can be incised with the author's miniature cystoscopic operating scissors, or by electro-incision Strictures of the body of the ureter can usually be adequately treated by cystoscopic dilatation Strictures of the pelvic outlet do not respond to cystoscopic dilatation, especially when open operation and ureteropelvicoplasty are employed If this is not recognized early nephrectomy is required In cases of ureteral reduplication and a low stricture in one ureter, failure to eradicate the blockage by instrumental methods requires ureteroheminephrectomy Inflammatory stricture of the ureter in children usually follows renal or periureteral infection Traumatic

stricture results more often from careless or unwise ureteral dilatation than from loin injuries The sclerotic healing is most resistant to treatment and usually leads to nephrectomy Excision of the stricture area is not to be employed in children

Blind-ending ureters are of clinical importance only when, by overdistention, they cause pain or become cystic masses This condition is usually not recognized except at operation or post mortem

Torsion of the ureter results from failure of the ureter to rotate with the kidney and, when marked, causes obstruction with proximal dilatation It is usually not recognized before advanced renal uropathy requires nephrectomy

Ureteral kinks are rarely congenital, but, rather, are secondary to peripheral obstruction either in the ureter or below In most cases relief of the peripheral blockage gives satisfactory urinary drainage, but sometimes it is essential to mobilize the secondarily linked ureter which may be firmly trapped by periureteral bands

In ureterocele, the ureteral orifice is always stenosed In some instances in females, the ureteroceles protrude through the urethra Ureterography regularly shows a dilated ureter above With extreme renal injury ureteronephrectomy is required, but when renal conservation seems at all practicable the ureteral orifice may be dilated instrumentally Should this fail, bisection of the protruding ureterocele mass, with a miniature cystoscopic scissors or the electro-incisor, is indicated

With diverticulum of the ureter, the sacculaton usually appears to be an abortive ureteral branching, but the condition is sometimes a "blow-out" due to distal ureteral obstruction The diagnosis is made by urography Diverticulectomy is indicated when complicating urinary infection or obstruction is demonstrated

Valves of the ureter are congenital mucosal redundancies, and when they cause obstruction, dilatation of the proximal urinary tract occurs Obstruction and infection may or may not be present Ureteral filling defects often give a sausage-like appearance, urographically Advanced renal damage demands ureteronephrectomy

Aberrant vessels causing compression of the ureter rarely affect the lower ureter In some instances the vascular compression is secondary A peripheral obstruction causes the lower ureter to dilate A transverse urographic filling defect in the lower ureter with dilatation above is strongly suggestive of vascular obstruction Division of the vessels relieves the obstruction, advanced renal injury demands ureteronephrectomy

Abnormal insertion of the lower ureter is far more common than is generally believed In the male, the ureter may open at the vesical outlet, prostatic urethra, seminal vesicle, or ejaculatory duct, in the female, the ureter may open in the urethra, vestibule, or vagina When in ureteral reduplication but one ureter and pelvis are involved with marked infection, ureteroheminephrectomy is indicated Ure-

teronecystostomy has also been employed. Occasionally the dilated ureter opens into a vesical diverticulum.

Ureteral stone may produce typical renal colic in children and many so called intestinal colics in early infancy are in fact ureteral colics coincident with the passage of clusters of uric acid crystals. Because of the small size of ureteral calculi in children roentgenographic demonstration may be difficult especially with uric acid stones. Non radio opaque stones may be demonstrated as vacuolated negative shadows but the use of wax bulb catheters may detect the stone. Most ureteral stones in children pass spontaneously to the bladder especially if aided by preliminary wide dilatation of the distal ureter with catheter or bougies. With pronounced renal injury or obstinate retention of the stone ureterotomy is indicated.

Extra ureteral compression may be due to persistent fecal overdistention of the upper rectum and pressure by vesical diverticula.

Primary dilatation of the ureter is a phase of neuromuscular uropathy.

Obstructions of the lower urinary tract commonly cause dilatation of the ureter as well as of the bladder and renal pelvis and are of utmost importance because both kidneys are involved. Vesico ureteral reflux appears and dilatation of the upper urinary tract is aggravated. Removal of the obstruction is readily achieved by comparatively simple trans urethral instrumentation chiefly electroresection. Congenital contracture of the vesical outlet and congenital median bar are seen in boys. Posterior urethral valves when large cause pronounced obstruction. Hypertrophy of the verumontanum is not very rare. All of these conditions are readily recognized by cystourethroscopy and removed by transurethral electroincision with the author's miniature resectoscope.

Congenital stenosis of the meatus is the most common lower urinary tract obstruction in children of both sexes. Occasionally urethral stricture elsewhere is congenital postgonorrheal stricture and traumatic stricture also occur in children. Simple meatotomy and later perineal dilatation with sounds cures meatal stenosis. Periodic progressive dilatation with sounds controls stricture of the deeper urethra. Phimosis must not be overlooked. Abnormal urethral openings are important only when the meatus is congenitally stenosed. Congenital penile torsion is of importance only with a tight meatus. A vesical diverticulum may rarely compress the lower ureter.

Neuromuscular uropathy is an extremely common cause of vesical dysfunction and faulty urinary drainage. One or both ureters may be dilated widely but renal injury and infection are the chief considerations. Usually the condition is congenital. Defects of spinal fusion are often demonstrable. The etiological theories include (1) persistence of the sausage type of fetal ureter (2) obstruction by fetal valves which have subsequently undergone normal

regression but have left a dilated ureter (3) neuropathic dilatation (4) atonic dilatation with and without insufficiency of the ureterovesical orifice (5) spastic contraction of the bladder (6) insufficiency of the ureterovesical valve and (7) ureteral stasis due to toxins. Often congenital megacolon is also present. Trauma of the central nervous system notably birth injuries and rarely syphilis may produce cord bladder. The diagnosis is readily made by combined urological and neurological examination. Quite often not only does spinal fusion and development appear normal but the neurological examination reveals nothing unusual. Nevertheless the bladder and often the upper urinary tract are widely dilated (so-called atonic bladder) and only by cystoscopy and cystometric studies can the neuromuscular abnormality be recognized. The treatment is likely to be unsatisfactory. In many cases and especially in spina bifida a neurosurgical attack gives gratifying results when compressing sacral fibrolipomatous masses can be removed or the intrasacral nerve can be liberated from perineural fibrous compression.

Isolateral dilatation of the ureter is commonly observed in chronic pyelonephritis. Atony is its ultimate effect of the inflammatory changes affecting the peristaltic mechanism of the ureter. The inflammatory atony is urographically demonstrated to be an irregular process and the ureter is more dilated in some portions than in others. The diagnosis rests upon (1) ureterography (2) establishment of the diagnosis of chronic pyelonephritis and (3) exclusion of peripheral obstruction. Nephrectomy is the ultimate treatment in many cases of chronic pyelonephritis. LOUIS NEWELL MD

BLADDER URETHRA AND PENIS

Tugarieffo P. Urethral Calculi (I calcoli dell'uretra)
Rev. di chir. 1937 3 517

Calculi which develop primarily in the urethra are rare. They must be differentiated from those which have their origin elsewhere and come to rest and develop secondarily in the urethra. The urethra is the most unusual site in the entire urinary tract for the origin of calculi. Usually the calculi develop in portions which may normally be dilated, such as the fossa navicularis, the bulbar dilatation and the prostatic dilatation.

The weight of urethral calculi may vary from a small fraction of a gram to several hundred grams. They may be single or multiple and as many as 250 have been found in one patient. The composition of these calculi varies but most of them contain ammonium and magnesium phosphate principally.

All age groups are represented among patients having urethral calculi with the highest frequency in the first three decades. Most calculi occur in the male. In the female calculi are always associated with diverticula.

The symptoms vary in type and intensity and depend upon the size, location and relationship of

the calculus to the lumen of the urethral canal. Burning on urination, vesical tenesmus, dysuria, urinary obstruction, hemorrhage, and disturbances in the sexual physiology may occur.

Complications are infrequent but important because they may represent the first manifestations of the disease. Urinary extravasation secondary to a traumatic ulcer of the mucosa is most serious, as is also ascending infection.

The diagnosis of urethral calculi should not be difficult if the condition is kept in mind. Careful analysis of the symptoms is important. The larger calculi may be palpated externally or rectally. Metal sounds within the urethra may produce a characteristic clicking sound upon striking the stone. Urethroscopy permits direct visual examination of the stone. The roentgenogram may be confirmatory.

The treatment of urethral calculi may vary widely and must be individualized. Spontaneous expulsion of the stone is always most desirable. This expulsion may be aided by mechanical pressure, lubrication, the use of small catheters as skids, and meatotomy. Dilatation of the urethra may be necessary. Occasionally the stone may be forced back into the bladder and then crushed and flushed from the bladder. When the stone is impacted or caught in a true diverticulum, urethrotomy is to be preferred. Such a procedure may be necessary as an emergency measure in some patients with acute urinary obstruction, periurethral abscess, or urinary extravasation.

The author includes a detailed case report with the details of an unusual situation, in which a sixty-six-year-old male had carried two very large calculi within a large diverticulum of the posterior urethra for twenty years asymptotically. The diverticulum was immediately posterior to a stricture of the urethra. There also were two diverticula of the bladder.

A. Louis Rosi, M.D.

Kreutzmann, H. A. R., and Colloff, B.: Primary Carcinoma of the Male Urethra. *J. Am. M. Ass.*, 1938, 110, 184.

Primary carcinoma of the male urethra is a rare disease, only 143 cases having been reported previously. Reports of 2 new cases bring the total to 145.

In reviewing the histories, it was evident that the site of origin of the growth could not be accurately determined in many instances, as the malignant process had spread beyond its original source at the time the patient was first seen. This was particularly so when the bulbous or the membranous portion of the urethra was involved.

For clinical purposes, the growths are divided into two main groups, according to their location. In the first group, the authors consider such growths as occur in the anterior or penile portion of the urethra, and in the second group, those found in the bulbomembranous or posterior portion. Anatomically, the bulbous portion is not a part of the posterior portion. It is included because the symptoms and physical signs of tumors located there are the same

as those of growths occurring in the prostatic and membranous portions. From a study of the end-results, it is apparent that this arbitrary division is a perfectly rational one.

The treatment which has given the greatest number of cures in cases of carcinoma involving the anterior portion of the urethra is partial or complete amputation of the penis. When the malignant process involved the posterior portion, resection of the urethra with the included growth gave the best results.

Inguinal adenectomy is advisable in all cases.

Sufficient data have not been obtained up to the present time to permit evaluation of roentgen and radium treatment without previous surgical intervention.

C. TRAVERS STEPITA, M.D.

GENITAL ORGANS

Mimpriss, T. W.: Treatment of Retention of the Testis. *Lancet*, 1938, 234, 533.

Although Bevan was by no means the first to operate on children suffering from retention of the testis, the views expressed in his paper in 1899 represented a great advance, and he laid the foundation for the surgical treatment which has now been employed for many years. Treatment underwent no further radical change until the introduction of hormone therapy by Schapiro in 1930, and enough time has now elapsed for some conclusions to be drawn as to the place of surgery and hormone therapy in this condition. The term retention is here used to include all cases in which the testis is absent from the scrotum at birth, cases in which the testis is occasionally absent from the scrotum are referred to as instances of retraction.

Three conclusions can justifiably be drawn from the first section of the paper.

1. The anatomical results of orchiopexy are better if operation is deferred until the period between the ages of ten and fourteen, i.e., the period of puberty.

2. An orchiopexy of the Bevan type is unsatisfactory as a routine procedure.

3. Spontaneous descent of the retained testis can occur in older children.

The next investigation into this subject took the form of a trial of gonadotropic-hormone therapy on a series of 14 new patients who were unselected except for the fact that they were between the ages of five and fifteen and included no patients with obvious ectopic descent or retraction of the testis.

The preparation used was pregnyl. This was administered intramuscularly in doses of 500 rat units, either once or twice a week. The number of injections varied between 8 and 40. The effect on all patients was to stimulate the growth of the external genitalia, i.e., the penis, scrotum, and testes. Descent of the testes was obtained in 4 children, and seemed to be entirely dependent on this increase of development of the genitalia. As development increased the testes descended further and further along the natural line of descent. The common char-

teroneocystostomy has also been employed. Occasionally the dilated ureter opens into a vesical diverticulum.

Ureteral stone may produce typical renal colic in children and many so called intestinal colics in early infancy are in fact ureteral colics coincident with the passage of clusters of uric acid crystals. Because of the small size of ureteral calculi in children roentgenographic demonstration may be difficult, especially with uric acid stones. Non radio opaque stones may be demonstrated as vacuolated negative shadows but the use of wax bulb catheters may detect the stone. Most ureteral stones in children pass spontaneously to the bladder especially if aided by preliminary wide dilatation of the distal ureter with catheter or bougies. With pronounced renal injury or obstinate retention of the stone ureterotomy is indicated.

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Obstructions of the lower urinary tract commonly cause dilatation of the ureter as well as of the bladder and renal pelvis and are of utmost importance because both kidneys are involved. Vesico ureteral reflux appears and dilatation of the upper urinary tract is aggravated. Removal of the obstruction is readily achieved by comparatively simple trans urethral instrumentation chiefly electroresection. Congenital contracture of the vesical outlet and congenital median bar are seen in boys. Posterior urethral valves when large cause pronounced obstruction. Hypertrophy of the verumontanum is not very rare. All of these conditions are readily recognized by cysto urethroscopy and removed by transurethral electroincision with the author's miniature resectoscope.

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regression but have left a dilated ureter (3) neuropathic dilatation (4) atonic dilatation with and without insufficiency of the ureterovesical orifice (5) spastic contraction of the bladder, (6) insufficiency of the ureterovesical valve and (7) ureteral stasis due to toxins. Often congenital megacolon is also present. Trauma of the central nervous system notably birth injuries and rarely syphilis may produce cord bladder. The diagnosis is readily made by combined urological and neurological examination. Quite often not only does spinal fusion and development appear normal but the neurological examination reveals nothing unusual. Nevertheless the bladder and often the upper urinary tract are widely dilated (so called atonic bladder) and only by cystoscopy and cystometric studies can the neuromuscular abnormality be recognized. The treatment is likely to be unsatisfactory. In many cases and especially in spina bifida a neurosurgical attack gives gratifying results when compressing sacral fibrolipomatous masses can be removed or the intrasacral nerve can be liberated from perineural fibrous compression.

Isolateral dilatation of the ureter is commonly observed in chronic pyelonephritis. A only is the ultimate effect of the inflammatory changes affecting the peristaltic mechanism of the ureter. The inflammatory atony is roentgenographically demonstrated to be an irregular process and the ureter is more dilated in some portions than in others. The diagnosis rests upon (1) ureterography (2) establishment of the diagnosis of chronic pyelonephritis and (3) exclusion of peripheral obstruction. Sphinctomy is the ultimate treatment in many cases of chronic pyelonephritis. LOTT, NET. VOLT. 11 D.

BLADDER, URETHRA AND PENIS

Tagariello P. Urethral Calculi (I calcoli dell'uretra).
Riv. di chir. 1937 3 537

Calculi which develop primarily in the urethra are rare. They must be differentiated from those which have their origin elsewhere and come to rest and develop secondarily in the urethra. The urethra is the most unusual site in the entire urinary tract for the origin of calculi. Usually these calculi develop in portions which may normally be dilated, such as the fossa navicularis, the bulbous dilatation and the prostatic dilatation.

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The symptoms vary in type and intensity and depend upon the size, location and relationship of

this in order to avoid fright or embarrassment. The dosage is then gradually increased until the second effect, abdominal pain due to the stimulating action of the pituitrin on the intestinal smooth muscles, is perceived. Different patients require different doses to produce this intestinal effect. In order to determine the optimal dosage, the amount administered at first is gradually increased, until a bowel movement occurs about a half or one hour after the injection. The dosage is then diminished to just under this amount, which will constitute the optimal dosage for that particular patient, to be maintained at the same level.

The actual genital hypoplasia is treated best with either the water-soluble fraction of pregnancy urine (PU) or, in suitable cases, with the pituitary sex hormone. One may begin with small doses such as 50 R. U., and gradually increase until doses as high as 1,000 R. U. are used. The hormone probably stimulates the anterior lobe of the pituitary gland to secrete more pituitary sex hormone, which in turn stimulates the interstitial cells of the testes, which elaborate their own hormone and stimulate the genital and secondary sex structures. However, any stage of the cycle may be initiated with the appropriate hormones. If there is no marked evidence of primary dyspituitarism, it is not necessary to stimulate the pituitary gland. For that reason the pituitary sex hormone in the form of an aqueous alcoholic extract of the sheep anterior-pituitary lobe, gynantrin, was used. Whereas follutein or antuitrin-S leads to stimulation of the interstitial testicular tissue, gynantrin directly stimulates both the interstitial and germinal tissues. Although it is well to be cautious in the treatment of endocrine dysfunc-

tions, the hazard of delaying proper treatment is sometimes great.

The treatment of poor sex pace by the use of follutein or antuitrin-S should be undertaken only after painstaking study since the majority of these cases have their origin in psychogenic factors and demand appropriate psychotherapy. In other patients, who are normal so far as can be gathered from the neuro-endocrine, physical, and psychic examinations, a weak sex urge may not be amenable to treatment. In these cases it is best to limit treatment to education so that the patient may learn to accept his condition as that which is normal for him. It is important that the patient's personality be considered as a whole, and that feelings of inferiority, backwardness, shyness, overcompensations, and depressions be treated by appropriate psychotherapy.

In infancy, small doses of thyroid have been found sufficient for the production of testicular descent. In childhood and older states, gonadotropic hormones have proved useful, and these were either the water-soluble fraction of pregnancy urine for patients with hypopituitarism, or the anterior-pituitary sex hormone which is somewhat better for patients whose pituitary functional defect is less striking. The water-soluble fraction of pregnancy urine increased the sex pace in one endocrinopathic patient.

Early treatment is advisable to forestall skeletal disproportions and persistent hypoplasias, and, since the accompanying psychic difficulties may be distressing, both the physical defects and the psychological maladaptations should receive appropriate treatment.

LOUIS NEUWELT, M.D.

arterial of the patients in whom the testes descended successfully prior to treatment was that their genital development was small and showed no evidence of a puberty change, and further that the testes were mobile and could be pushed down in the direction of the scrotum. The remaining 10 children failed to obtain descent.

There are two possible objections to the routine use of hormone therapy. Stimulation of the reproductive system may be (1) undesirable, and (2) harmful. Precocious sexual maturity has been recorded on many occasions and has led clinicians to withhold hormone therapy in young children. The question of late damage to the testes was raised by Cabot in 1936 and is not yet settled.

The following conclusion can be drawn regarding hormone therapy and spontaneous descent.

1. Spontaneous descent of the retained testes may occur between birth and puberty and is dependent on the increased development of the reproductive system.

2. Persistent retention in the presence of increasing development signifies that the testes are retained through a mechanical abnormality which can be overcome only by operation.

3. Hormone therapy aims at stimulating the development of the reproductive system and therefore hastens descent. Its routine use is unnecessary as natural development will usually occur and is undesirable as it produces precocious puberty and may cause atrophy of the testes that are mechanically retained. It should be withheld until the age of twelve and then used for children in whom natural development is not taking place.

Management therefore aims at correcting a developmental fault or mechanical fault or combination of the two. If both faults are present development must if possible be rectified first as undeveloped testes with a short cord cannot be transplanted satisfactorily into a rudimentary scrotum. Retarded development may be corrected by natural growth or by hormone stimulation. Mechanical retention can be overcome only by operation.

The general consensus of opinion points to the Keefley Torek technique as the most satisfactory. This method enables the testes to be held in good position indefinitely while the scrotum enlarges. This is one reason why the results are good; another is that the technique can be employed only if the testes will reach well down into the scrotum. The septal transposition operation also has these advantages but fails to produce as good an anatomical result.

In the later operations of this series there has been a slight deviation from the Keefley Torek technique. A much smaller anastomosis was made between the lowest part of the scrotum and the skin well down on the thigh. The processus vaginalis was divided just below the internal ring and the distal portion was not dissected from the cord. The tunica vaginalis was then sewed down to the fascia of the thigh so as to hold the testes well down in the scrotum. No

stitch was inserted into the testes, which were left in the scrotum but anchored by their tunica vaginalis.

This modification was employed as in the course of experimental work it was noted that the passage of a stitch through the tunica albuginea of the testes had an adverse effect on their histological appearance. In practice it has also been an improvement in that at the second stage the testes were left entirely free in the scrotum and showed no tendency to become adherent to the scar of the cratal incision. It is true that by leaving the processus vaginalis distal to the internal ring *in situ* the surgeon cannot gain extra length by a thorough dissection of the cord. If operations are performed on properly selected cases there is seldom difficulty in placing the testes into the scrotum, should difficulty be found it is better to follow Cabot's suggestion of leaving the testes at the external ring and operating later to obtain the scrotal position.

By the adoption of the principles which have been outlined it is believed that spontaneous descent will be a common event that hormone therapy will be employed in suitable cases and that operative treatment, though less often necessary, will show a high proportion of satisfactory results. Both orchopexy and hormone therapy, applied without proper indications, can do more harm than good.

C. TRAYLOR STEPHEN, M.D.

MISCELLANEOUS

Rubinstein H. S. The Treatment of Genital Hypoplasia in the Male. *Endocrinology* 1938 31 43.

Genital hypoplasia may be limited to the sex organs but usually it is accompanied by more general manifestations, physical and mental. The latter not only involve aberrations in physique but may, especially in older patients, lead to feelings of inferiority or inadequacy, neurotic behavior and occasionally to actual reactive depressions. Since attempts to correct the physical defects may therefore prove inadequate, a series of 8 cases is presented to portray the clinical and therapeutic features involved in the treatment of such conditions.

This material shows that treatment of genital hypoplasia cannot be limited to the use of one drug or hormone, or to any other single procedure. Only when the patient is studied thoroughly and evaluated as a personality can appropriate measures be instituted. With infantile patients thyroid in small doses usually suffices and the same drug is efficacious in combating the symptoms of hypothyroidism in older patients.

The disturbances in fat and water metabolism were overcome with effective doses of pituitrin O administered intramuscularly two or three times weekly. It is important to begin with small doses from 0.001 to 0.002 gm which lead to marked pallor within several minutes because of the constricting effect upon the smooth muscle of the peripheral blood vessels. The patient should be warned about

adventitious bursa is responsible. There is no recognized bursa constantly present in this region, but presumably bursæ of the adventitious type may form at unusual points in response to irritation. The concept of a bursitis gained impetus from Osgood's report (11) describing 3 cases. One presented a typical bursal sac filled with glary fluid and not communicating with the joint cavity. The two others disclosed, respectively, a smooth-walled space not containing fluid, and a solid nodule, bluish gray in color. It may be observed that only very rarely bursal sacs resembling those familiarly encountered elsewhere have been found in this region either at operation or post mortem. Some workers have maintained that what was taken to be a bursa was in reality an upward prolongation of the synovial sac of the elbow joint. This may well be true since the joint cavity on the lateral aspect uniformly extends from $1\frac{1}{2}$ to 2 in above the line of the radio-humeral joint. Accordingly, the entire lateral condyle is intra-articular in contrast to the extra-articular position of the medial extremity of the humerus. An incision through the musculotendinous mass over the lateral epicondyle opens into this synovial-lined space and the connection with the joint cavity is not readily observed if the forearm is in the extended, pronated position. Carp presents very interesting evidence of a bursitis in a patient with acute involvement and an opaque shadow near the epicondyle in the roentgenogram. Following firm digital pressure the symptoms were relieved, and the x-rays indicated dispersion of the shadow previously observed. This was interpreted as a rupture of the bursa in a manner similar to that employed for ganglia about the wrist. One is forced to conclude from the reports in the literature that in the occasional instances in which a bursa is present in this region, irritation or inflammation thereof may account for the symptoms of tennis elbow. Such a structure is unusual, however, and in the majority of patients with symptoms of tennis elbow some other explanation must be sought.

An explanation which is valid in this group of cases is that the lesion is a disruption or tear of one of the extensor tendons near its origin at the epicondylar ridge with associated periostitis. Cyriax holds this opinion, as do also Hohmann (7), Ogilvie (10), Hansson (6), and others. The extensor carpi radialis brevis, having the most distal origin of the group of extensor muscles and consequently lying in closest proximity to the bone and to the radiolateral joint, is most commonly involved. In most respects this explanation harmonizes with the clinical findings.

The delayed onset of pain is characteristic of any muscular trauma, its occurrence coinciding with the reactionary phase of edema and exudation. The chronicity of the complaint may be due to healing of the tear with scar contracture and adhesion formation. It is startling to realize, as Hansson points out, that there is on an average a difference of 8.4 cm in the distance between the points of origin and insertion of the extensor communis digitorum muscle with the wrist and fingers in the positions, respectively, of complete flexion and extension. Any loss of elasticity or contracture from scar formation might therefore be expected to produce painful disability. Some cases have an actual periosteal fracture if the tear or separation occurs exactly at the point of origin of the muscle from the bone. Hansson states that this periosteal reaction usually can be demonstrated if x-ray films are taken in a plane 45° oblique to the epicondyle. Other authors have presented similar roentgenographic evidence of periostitis. The negative findings usually encountered at operation as well as the relief obtained by various operative procedures are also consistent with the view that the lesion is a muscular tear or separation.

Several other lesions have been proposed. Preiser (12) postulated a congenital deformity in which the head of the radius projects laterally beyond the humeral condyle instead of accurately fitting the capitellum. This view has met with no support since the postulated deformity is generally not present and even when shown it may be based upon faulty interpretation of the x-ray films. Mills thinks the lesion is a displacement of a frayed edge of the coronary ligament analogous to a dislocated meniscus in the knee. This, he says, accounts for the clicking sound at the moment of reduction by manipulation. Trethowan (14) regards the condition as a traumatic synovitis of the elbow joint in which one of the synovial fringes, which are always found in the joint extension anterior to the lateral condyle, has become nipped between the bones. Although the consensus of opinion is that the condition is traumatic, toxic manifestations from a remote source of rheumatoid or influenzal nature have been proposed to explain it.

Treatment. As is to be expected, the divergent opinions on the nature of the lesion reflect themselves in the therapeutic proposals which have been made. Cyriax lists the measures which have been employed, they run the gamut of the physiotherapeutic modalities and even include thyroid extract and the vitamins. Those which have been attended with more or less success in

TENNIS ELBOW

Collective Review

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THE Section on Orthopedies of the Royal Society of Medicine held a symposium on tennis elbow in 1929. In closing a lengthy discussion, the chairman remarked that, if time permitted he would have liked to disagree with all of the previous speakers. Whereupon the British Medical Journal commented editorially, "the impression left in our mind by this discussion is that the etiology of tennis elbow is various its pathology is obscure and its cure is uncertain. The past eight years have seen little in the way of clarification of the subject although an increased interest has been manifested on this side of the Atlantic. Cynax of London (3) and Carp of New York (1) have published comprehensive reviews in American journals and these have been drawn upon liberally in the preparation of this article.

A few men particularly in England, seem to have had considerable experience with tennis elbow but by and large surgeons either encounter it infrequently or fail to recognize it as a clinical entity. It may well be that the term is loosely applied to a variety of conditions which may eventually be separated into distinct entities as Codman (2) has already done with the numerous lesions encountered in the structures around the shoulder joint.

Proteative factors From the clinical standpoint tennis elbow is a painful disability not confined to tournament or even occasional tennis players but seen either as the result of prolonged overexertion or as an occupational disability in individuals whose recreational or workaday activities involve forcible extension and supination of the elbow combined with a clenched hand grip upon some object. It is thus encountered among participants in tennis squash badminton or golf and also in amateur gardeners occasional and presumably awkward oarsmen workers with hand tools pressers of clothing salesmen carrying heavy grips violinists housewives doing laundry work particularly wringing clothes or ironing coachmen and blacksmiths. Although it occasionally results from direct trauma rather than by the indirect means described it is not seen in the youthful trained athlete participating in

sports. It is rarely encountered in individuals under the age of thirty, and hence probably denotes some degree of degenerative process as a basic factor.

Clinical findings The typical case develops insidiously. During the actual performance of physical activity the victim may be mildly conscious of discomfort, but severe pain is experienced only some hours or days later. The pain centers over the lateral aspect of the elbow joint and radiates down the extensor aspect of the forearm into the hand. The discomfort is aggravated by rotation of the forearm or by grasping any object, even a light one. Often a sharp twinge of pain will cause the patient to drop whatever he may be holding. Usually, nothing is to be seen on inspection although several authors who regard the condition as a bursitis have described a loss of the normal contour due to swelling in the region concerned. Passive movements of the elbow and radio ulnar joints are painless and unrestricted except in some chronic cases in which according to Mills (8, 9), there is a slight limitation of extension of the elbow if the forearm is in pronation. The most characteristic local finding is point tenderness. Most authors describe this as directly over the tip of the lateral epicondyle. At other times it may be slightly anterior to the epicondyle or over the radio-humeral joint. The proximity of these various points makes accurate localization difficult. Pain when grasping or lifting is frequently noted by the patient when the forearm is supinated but not in pronation. The x-ray examination or diagram reveals nothing. However, calcified deposits have been shown in this region numerous times notably by Carp (1) and by Schmitt (13). These depositions are as a rule distinctly above the epicondyle rather than in a position corresponding with the maximum tenderness. In any case the x-ray findings are far from constant.

Pathology Although general agreement exists concerning the reality and clinical characteristics of the entity known as tennis elbow, there is no unanimity of opinion with respect to the pathological lesion responsible for this condition or its proper treatment. According to one view an

flexed in the hand-grasp position may cause this condition.

3. The usual complaint is pain centering over the lateral aspect of the elbow and aggravated by the activities just described. Local tenderness is present and in the chronic cases at least some authors have called attention to a slight resistance to passive extension of the elbow. The x-rays show nothing in the majority of instances.

4. The lesion has been variously supposed to be a bursitis, an articular involvement of the nature of an internal derangement or traumatic synovitis, a pure periostitis, or a separation of one or more of the extensor muscles from their origin with secondary periosteal reaction. The existence of a bursa at this point seems to have been proved in a limited number of cases, but the explanation of tearing of the muscular fibers would appear to account for the majority.

5. Conservative measures including immobilization on a suitable splint are indicated in the acute phase with the assurance of a satisfactory

proportion of favorable results. In those cases which become chronic, manipulation has been successful in the experience of many surgeons. Operation has been advocated by some but should rarely be required and rests rather upon an empirical than on a rational basis.

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various hands include (1) cock up splintage, (2) manipulative maneuvers, and (3) various types of operative procedure. Spontaneous cure has also been observed. Dubs (4) perhaps expresses the truth in a nutshell when he says that tennis elbow is a lesion "which tends to heal with and without treatment."

Although Mills and others believe that spontaneous cure is unlikely, there certainly are patients who recover either from the acute or the chronic phase without much in the way of specific treatment. In some the course may be protracted to from eight to twelve months, the condition eventually disappearing with no therapy other than the palliative use of local applications, radiant heat, and a sling. Recurrence is unlikely under these circumstances.

The purpose of a cock up splint is to put the extensors in a position of relaxation. Hansson and Horwich report 12 of 16 cases which were cured in a month with this simple measure. They do not mention recurrence, although Cyriax, arguing on theoretical grounds, believes that the position of physiological rest on a cock up splint may predispose to recurrence by permitting healing to take place with shortening of the involved muscles.

Manipulation is especially favored by English surgeons and generally restricted to chronic cases. Most of them employ a maneuver similar to that described by Mills. This is a forcible extension of the pronated forearm with the fingers and wrist flexed. At the same time firm pressure is made over the point of maximum tenderness. It is in effect, the reverse of cock up splintage in that it involves stretching of the extensors. Mills stresses the importance of an audible click as the criterion of a successful manipulation. He claims an immediate cure in two-thirds of his cases and by repeated manipulation ultimately relieves five sixths of his patients. Occasionally the result is dramatic but in some cases two weeks are required for complete recovery. Mills reported recently that he has done manipulation in 33 cases and that it should be done only in those patients who show a slight springy resistance to full extension of the elbow. This sign should be elicited by comparison with the other side and often can be obtained only with the forearm in pronation. Cases with acute muscular tenderness he treats conservatively with rest and splinting. Ogilvie and Trethowan are in agreement that this type of manipulation is of value in the chronic cases with adhesions. Cyriax has modified the procedure of Mills with the definite intent of converting a partial muscular tear into a complete

one and then securing healing with lengthening. After a period of deep friction massage over the epicondyle, he extends and supinates the forearm and then sharply adducts the elbow into cubitus varus. He reports good results in 21 cases, but on only 3 occasions was a single manipulation sufficient. On an average 4 treatments were required, and his patients were reported as recovered at varying periods up to four months. In 9 of 21 cases three weeks or more were required for recovery. Cyriax expects definite evidence of periosteal reaction after treatment but this gradually diminishes. Carp, contending that the lesion is a bursitis, employs a form of manipulation in which he uses firm digital pressure and thereby strives to rupture the bursa and disperse its contents.

The operative measures employed have been varied. Certain common features are apparent in all of them however. With the exception of those workers who have found what appeared to be a definite bursal sac and those who in opening the joint have discovered hyperemic synovial fringes, most of them have reported their explorations as being uniformly negative. Almost all of the operations which have been advocated involve a division of the fibers of the common extensor muscles down to the bone with temporary interruption of their continuity. Codman did this some years ago in a single case and Hohmann more recently has reported 13 operations followed by relief in all except one. Fischer (5) recommends stripping the periosteum from the epicondylar ridge which is a more radical method of securing the same effect than a transverse incision to the bone. Trethowan opened the radio-humeral joint in 8 protracted cases which had resisted both physiological rest and manipulation and removed hyperemic protrusions of the synovial membrane. It is doubtful whether any considerable proportion of cases justifies operative intervention. Even those surgeons who advocate it confine themselves to the more stubborn cases and some of them even concede that the necessary period of postoperative immobilization may influence the good results obtained.

SUMMARY AND CONCLUSIONS

1. So-called tennis elbow is a clinical entity which either is not seen as frequently or not recognized as commonly in this country as it is abroad.

2. The etiological factor producing this syndrome may be tennis but likewise any activity calling for violent rotation of the forearm with the elbow extended and the fingers and wrist

Ober, F. R.: Osteomyelitis in Children *Am J Surg*, 1938, 39 319

Osteomyelitis in childhood is a serious disease of high mortality. It may come on as a sequel to a skin infection, chicken pox, middle ear or sinus trouble, or other acute infections. The organism may be the staphylococcus, streptococcus, or, rarely, the pneumococcus.

In children under two years of age, the problem is different from that in older children because of the difference in character of the bones. The clinical picture is that of great prostration with high fever of acute onset, and tenderness in the affected part. As the infection proceeds, swelling is noticed, usually near a joint. The joint itself may be distended with fluid, but not pus. The organism is usually the streptococcus and the pathological change is a localized necrosis of the bone near the epiphysis. Treatment, twenty-five years ago, consisted in emergency operation for evacuation of the bone abscess. Frequent dressings were made and the mortality was 50 per cent. At the present time operation is considered of minor importance and is delayed until the general condition of the child improves. Mortality is now less than 5 per cent. Vaseline packs, voluminous dressings, and plaster casts are now used after operation and the dressings are changed only once a week. The cast is removed in from eight to ten weeks.

In children over two years of age the infecting organism is usually the staphylococcus. Necrosis of the shaft results in sequestrum formation. The periosteum is more resistant than in younger children and the pus, instead of breaking through it, travels under it and up the shaft. The entire shaft may become a sequestrum. Symptoms are about the same as those in younger children but there is usually tenderness over the entire shaft of the affected bone. After about ten days, the roentgenogram will show necrosis of the bone. Treatment should first be directed toward the improvement of the general toxemia. Sulfanilamide may be used in suitable cases. The bone may be drained later, but only the simplest operation on the bone should be done in this type of case.

A second type, in which the general condition is good, may react satisfactorily following immediate operation and opening of the cortex. A third type, in which there is no true pus, does not need operation, but only splinting and rest.

Chronic osteomyelitis may be (1) the sclerosing type, (2) Brodie's abscess, or (3) the aftermath of the acute form.

The sclerosing type is characterized by constant boring pain without constitutional symptoms. There is a dense thickening of the cortex. It may improve with long rest and protection from weight bearing or may need surgical intervention.

Brodie's abscess is a small localized necrosis walled off by dense bone. Staphylococci may be found or there may be no organisms demonstrable. The symptoms are intermittent attacks of pain. In treatment,

operation is usually necessary. The abscess wall is thoroughly curetted down to the bleeding bone and packed with vaseline gauze.

Chronic osteomyelitis following the acute attack is the type almost always seen in children more than two years old. The symptoms are mild. Abscesses occur over sequestra and may need opening. Surgery should be conservative, dead bone must be removed with as little damage to living bone as possible.

In late chronic cases the bone should be opened wide, "saucerized," and an attempt made to fill in the cavity with muscle tissue.

WILLIAM ARTHUR CLARK, M D

Eger, W.: Osteitis Fibrosa and the Parathyroids in Animal Experiments (Ueber Ostitis fibrosa und Epithelkörperchen im Tierversiment) *Beitr z Path Anat*, 1937, 100 19

The author propounds two questions

1 Does a disturbance of the metabolism affect the parathyroid glands and thereby produce bone disease? While it is accepted that altered metabolism engenders bone changes, the behavior of the thyroid glands requires investigation.

2 How are the bones affected when the metabolism is altered after resection of the parathyroid glands?

The experimental animals were young growing rats. Several groups of experiments were tried, lead acetate, ammonium chloride, thallium acetate, and narcotics were administered. Controls were treated with aluminum acetate and phosphoric acid.

Bone changes occurred only if a solution of lead was injected. The changes corresponded with those seen by other authors, and they simulated the earliest forms of osteitis fibrosa generalisata in human beings as demonstrated by Hanke. Bone changes were always found if there were preceding changes in the parathyroid glands (which were hypertrophied up to 5 times their normal size), and were in direct parallel with the severity of the hypertrophy. These findings answer the first question in the affirmative, the etiological basis is probably the acidosis produced. The second question could not be answered since the experimental agents, ammonium chloride and glucose, or ammonium chloride combined with glucose administered during ether narcosis, elicited no bone changes.

In conclusion, osteitis-fibrosa-like bone changes were engendered in rats by chronic lead poisoning and were apparently produced constantly with hypertrophy of the parathyroids, the latter was considered a secondary alteration of a primarily disturbed metabolism.

(HELLNER) JEROME G FINDER, M D

Weil, M P., and Lalanne, L.: The Rôle of the Ligament in the Production of Osteophytes (Du rôle du ligament dans la production des ostéophytes) *Presse méd*, Par, 1938, 46 123

While it may be possible in advanced stages to make a distinction between vertebral osteophytes

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Robertson D E Acute Hematogenous Osteomyelitis *J Bone & Joint Surg* 1938 20 35

Three hundred and twenty seven cases of taphylococcal and streptococcal osteomyelitis have been observed in the past thirteen years. The streptococcus was responsible for 13.3 per cent of the cases of fatal septicemia and the staphylococcus for 22.4 per cent. There were 183 cases of staphylococcal osteomyelitis which came under observation before the use of antitoxin, with a mortality of 22.4 per cent, and 0.4 cases which came under observation since the use of antitoxin with a mortality of 21.27 per cent.

Streptococcal and taphylococcal osteomyelitis are entirely different in their clinical manifestations. No sequestra have occurred in patient surviving a streptococcal infection whereas patients with staphylococcal osteomyelitis practically never get well without the formation of sequestra.

The natural resistance of individuals appears to consist of at least two known agents: (1) the natural antitoxin which neutralizes the toxin produced by the organism, and (2) the destruction of the organism by phagocytosis. The toxin produced by the staphylococcus is in reality made up of three toxins namely leucocytolysins, hemolysins, and necrotizing toxins.

The antitoxin of the blood may now be definitely measured in terms of anti hemolytic units.

Three hundred and five individuals in apparently normal health were used to determine the common range of titers. This investigation showed that there is no great variation in the titer during any particular year or term, the titers averaging under one unit. In the presence of disease the titers were followed and there was practically no disturbance of the average titer except that in cases of tuberculosis it was perhaps lower. In skin infections the toxin does not seem to act as an efficient antigen and so the titer is usually low.

A study of 9 adults showed that it was clinically possible to raise the person's anti hemolytic titer at least fivefold with the administration of one course of toxoid.

The author believes that the level of antitoxin must be kept at least three times that of the normal in all cases of chronic or healed staphylococcal osteomyelitis and that toxoid should be administered if there are less than three units of antitoxin present. There have been no experiences of an adverse nature with the administration of toxoid. A special follow up of this type of case is being done now and results should be available in a few years.

It should be possible to prevent bone lesions in children by giving a course of toxoid.

The clinical picture points to the fact that the organisms commonly get into the blood from a local lesion in the skin and rarely from the respiratory or gastro-intestinal tracts. Experimental work carried out by the author showed that a young animal had to be used if he wished to develop an osteomyelitis. Organisms introduced into adult animals caused only septicemia and in some cases arthritis. In bones the lesion were found to be located in three places: the metaphysis, the medulla of the epiphysis and beneath the periosteum. The experimental work seems to indicate that the local lesion in the bone is found most frequently in the metaphysis and that it occurs as the result of a combination of slowing up of the blood stream and lack of phagocytic elements in the metaphysis.

Trauma is well recognized as a means of devitalizing tissue which subsequently is very fertile soil for organisms. Hemorrhagic areas are ideal for the growth of bacteria. Any tissue which has a poor blood supply is very weak in resisting infection.

The pathological picture in human beings is that of an infection of the metaphysis occurring only in children before the epiphyseal line disappears. Periostritis and epiphysitis occur. The organisms lodging in the metaphysis produce an exotoxin which may cause necrosis. The exotoxin is highly poisonous in circulation in the blood causing the general symptoms. In infection in the region of the metaphysis pus is formed and the periosteum is stripped up with the loss of the blood supply.

The intense pain, the general reaction, the limitation of movement of the joints and the local tenderness in a patient who has had a skin lesion or sprain a short time before and in whom the blood count is elevated are proof of an osteomyelitis of a staphylococcal nature.

There are some cases with a history which was acute at first but which quieted down and remained quiet over a long period of time. There is no doubt that organisms can reach an equilibrium or come close to an equilibrium in the tissue in which they live and in the part of the body in which they live. When death follows the opening of a Brodie's abscess one wonders if it is due to liberation of toxin or if so these cases would be better treated by a preliminary course of toxoid.

Formerly the author's practice was to operate early upon the lesion but recently he has felt that an early operation does not benefit the patient. The problem in an early case is one of combating a blood infection and dealing with a toxin and organisms which are present. Until some approach to an equilibrium has been reached surgery in so far as incision of a local lesion goes has nothing to offer. When the condition has reached a stage in which pus is present simple drainage may be of advantage.

RICHARD J. BENNETT JR. M.D.

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2 How are the bones affected when the metabolism is altered after resection of the parathyroid glands?

The experimental animals were young growing rats. Several groups of experiments were tried, lead acetate, ammonium chloride thallium acetate, and narcotics were administered. Controls were treated with aluminum acetate and phosphoric acid.

Bone changes occurred only if a solution of lead was injected. The changes corresponded with those seen by other authors, and they simulated the earliest forms of osteitis fibrosa generalisata in human beings as demonstrated by Hanke. Bone changes were always found if there were preceding changes in the parathyroid glands (which were hypertrophied up to 5 times their normal size), and were in direct parallel with the severity of the hypertrophy. These findings answer the first question in the affirmative, the etiological basis is probably the acidosis produced. The second question could not be answered since the experimental agents, ammonium chloride and glucose, or ammonium chlorate combined with glucose administered during ether narcosis, elicited no bone changes.

In conclusion, osteitis-fibrosa-like bone changes were engendered in rats by chronic lead poisoning and were apparently produced constantly with hypertrophy of the parathyroids, the latter was considered a secondary alteration of a primarily disturbed metabolism.

(HELLNER) JEROME G FINDER, M D

Weil, M P, and Lalanne, L.: The Role of the Ligament in the Production of Osteophytes (Du rôle du ligament dans la production des ostéophytes) *Presse méd.*, Par, 1938, 46 123

While it may be possible in advanced stages to make a distinction between vertebral osteophytes

and calcification of the vertebral ligaments Wed and Lalanne have found that it is often impossible to differentiate the two clearly by roentgenological examination in the earlier stages. An osteophyte may follow the course of a ligament and calcification of the ligament may give rise to irregular production of new bone as indicated by the roentgenographic findings. Both lesions characteristic of osteo-arthritis with osteophyte formation and those characteristic of calcification of the ligaments may be present.

The authors have recently examined 10 anatomical specimens showing pathological changes in the vertebrae from the Dupuytren museum for which unfortunately the clinical history is not available. In these specimens lesions typical of rheumatic spondylosis with calcification of the vertebral ligaments in which the bony formation followed the line of the ligaments regularly and exactly were found in some areas of the spine and in other areas lesions typical of degenerative osteo-arthritis with irregular osteophyte formation. In some cases with typical changes of osteo-arthritis in the vertebrae the formation of new bone followed the line of the ligaments and resembled typical calcification of these ligaments. In other cases of osteo-arthritis typical osteophytes were found in addition to such typical calcification of the ligaments. Thus the coexistence of these two forms of new bone production is found to be a common pathological finding as indicated by roentgenographic findings.

The vertebral ligaments evidently serve as a natural conductor for the process of calcification in the early stages of new bone formation. Later such formation may become irregular and more exuberant and take the form of the osteophyte. In neither case is normal new bone formed as shown by the findings of many pathologists. Thus the roentgenological findings cannot indicate definitely the specific nature of the bony lesions.

ALEX M. MEYERS

Harry N. M. The Recovery Period in Anterior Poliomyelitis. *Brit. M. J.* 1935 1: 104.

In England about 640 cases of poliomyelitis occur annually but there never has been a big epidemic. More accurate information is required regarding the length of time necessary for recovery so that patients may be allowed to be up in a minimum time without danger of further muscle damage.

This paper is based on a study of the muscle charts on which has been recorded the progress of 36 patients in the Royal National Orthopaedic Hospital.

The accepted method of treatment has been as follows:

During the acute stage the patient is kept in bed with the affected limbs immobilized in casts or plasters. When the muscle tenderness is gone radiant heat massage and motion are started with avoidance of over stretching and fatigue of the muscles. The exercises are done in warm water baths and in a few instances where one muscle is weak in a group of similar function electric stimulation of the one weak muscle is done.

The strength of each muscle tested is recorded on the muscle chart. The symbols used are N for normal, R+ for contraction against gravity and resistance, R- for contraction against gravity only, G for contraction but not against gravity, F for flicker and O for no contraction. This eliminates indefinite statements and dependence on memory.

The patients studied were from four to fourteen years of age. The recovery period has been variously estimated at from two to four years by different clinicians. However, one is not justified in fixing an arbitrary time beyond which no further improvement can be expected. For example one child who had not had previous treatment showed improvement after six years in the thumb muscles after proper splinting and muscle training. Operations especially arthrodesis should not be done until all efforts to obtain improvement by other methods have been exhausted. In some cases it has been found that muscles have improved greatly in strength after arthrodesis had supplied the needed rest but this rest could have been obtained by splinting.

In the lower limbs the gluteal muscles showed the greatest degree of improvement under treatment and the tibial muscles the least. Possibly the tibial muscles showed the least because of insufficient splinting in the proper position. In general the greatest improvement came in the first four months. In 10 instances in which all muscles of the lower limb were marked O or F after four months the limb remained flail. In this series improvement continued until from nine to eighteen months in some cases even after that time but in the vast majority no great change was noted after one year of treatment. Untreated patients and children too young to co-operate are the ones in whom recovery drags out from two to four years. A patient may be allowed to be up as soon as the leg muscles will contract strongly against resistance. If the spinal muscles are involved recumbency must be long but speaking empirically the patient should not be kept in bed more than two and one-half years; he should be allowed to get up after that period of time with a spine brace if one is necessary. If scoliosis develops and grows worse in spite of braces operation for spinal fusion must be considered.

WILLIAM ARTHUR CLARK M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

Burman M. S. The Spastic Hand. *J. Bone & Joint Surg.* 1935 17: 133.

In persistent spastic opposition position of the thumb with or without flexion of its terminal phalanx the thumb is drawn into opposition by the action of the opponens pollicis, the flexor pollicis brevis and the abductor pollicis brevis muscles.

The author discusses the attempts which have been made to correct this deformity. Some of the methods have been the following: (1) shortening of the extensor pollicis longus (2) tendon transplants.

tion in which the extensor indicis proprius is attached to the extensor pollicis longus, (3) shortening of the abductor pollicis longus, (4) transplantation of the flexor carpi radialis to the extensor pollicis longus, (5) transplantation of the flexor carpi radialis to the abductor pollicis longus together with one-half of the extensor carpi radialis, (6) complete or partial resection of the nerve supply to the opponens pollicis or flexor pollicis brevis, (7) a tenotomy of the muscles which terminate on the ulnar sesamoid of the thumb, or a myotomy of the opponens pollicis as well as an incision of the adductors.

The author makes a longitudinal incision under local anesthesia. The opponens pollicis is stripped subperiosteally from the shaft of the first metacarpal. The common tendon is severed from its point of insertion and stripped proximally for at least three-quarters of an inch. The capsule of the metacarpophalangeal joint may be cut if contracted. The common tendon is excised after it has been stripped. The thumb is immobilized in abduction and extension in the plane of the hand for three weeks.

In plastic lengthening of the flexor pollicis longus at the wrist the tendon is located through a one-inch longitudinal incision above the wrist joint and lengthened by a Z-shaped incision.

The author has done the operation of thenar stripping eight times. If a tendon transplantation can be done, which will give abduction, it should be done in combination with the operation of thenar stripping. There has been no recurrence of this deformity in any of the cases in which the operation has been performed. If the joint capsule is opened slight restriction of flexion of the metacarpophalangeal joint of the thumb may develop.

A long period of physical therapy should follow the operation. The appearance of the hand is improved from a cosmetic standpoint although there is very little functional use.

In spastic adduction contracture of the thumb, the contracture is due to the contracture of the first dorsal interosseus muscle and the adductor obliquus pollicis and adductor pollicis transversus.

The author makes a longitudinal incision. The first dorsal interosseus muscle is stripped subperiosteally from the shaft of the third metacarpal. Section of the combined tendon of insertion of the two adductors is carried close to the bone. The thumb is immobilized in full abduction in the same plane of the fingers. Immobilization is maintained for about three weeks, when exercises are begun. Two cases have been corrected with good results in as much as active abduction and adduction were attained.

In spastic hyperextension of the fingers in intrinsic muscle imbalances hyperextension of the proximal and distal interphalangeal joint is associated with flexion of the metacarpophalangeal joint in intrinsic muscle imbalance.

The author's method is to make two incisions on each finger. Each collateral tendon is severed transversely distally and stripped proximally. The entire tendinous band is removed at the mid-part of the

first phalanx below the proximal interphalangeal joint. The thin central fascial extension over the second phalanx is untouched, and it is through its action that extension is hoped for. The common extensor tendon is sectioned transversely at the level of the proximal interphalangeal joint. The finger is bandaged in flexion.

Spastic flexion-abduction position of the fingers is maintained by a spasticity of the interossei dorsales in excess of the interossei volares. No operations have been done in these cases but stripping of the affected interossei dorsales has been recommended.

Spastic anterior subluxation of the head of the first metacarpal bone is due usually to overpull of the long and short extensors of the thumb, by a bowstring action, and the head of the first metacarpal is forced forward. The conclusion is, that after these procedures, care should be taken to put pressure dorsally upon the head of the first metacarpal either by splint or by plaster.

RICHARD J. BENNETT, JR., M.D.

FRACTURES AND DISLOCATIONS

Beekman, F.: Compound Fractures in Childhood.

Am J Surg, 1938, 39, 312

In children, conservatism in the treatment of compound fractures should be the rule. An injury which would call for amputation in an adult will often result in recovery of the limb with good function in a child if properly treated. A child goes into shock very easily after severe injury, and if subjected to radical treatment, such as a prolonged operation, before time is allowed for reaction may succumb. Delay is not dangerous, since deformity of a limb can be corrected at any time later.

The worst type of compound fracture is that caused by external violence, such as a crush by an automobile wheel. The skin and muscles may be completely avulsed, and vessels, the comminuted bone, and nerves exposed. Such limbs, if properly treated, may heal with good function.

The limb should be splinted at once before the child is moved from the scene of the injury. If the bone fragments are protruding, they should not be allowed to go back into the wound until they have been cleaned. Extension of the limb is important from the first to eliminate dead space and prevent muscle contracture.

The wound, even if only a small puncture, must be cleaned under aseptic conditions, hematoma, if present, must be evacuated and hemorrhage controlled. After the soft tissues have been cared for, the fracture is reduced. Final reduction should be done at this time because manipulation later may cause diffusion of infection with disastrous results. If the fragments are locked together, a plaster cast may be applied, but if they cannot be locked, suspension and traction must be used. Ten pounds of weight is usually sufficient for a femur and 6 or 7 for a humerus. Skeletal traction may be used if the wire is placed proximal to the epiphyseal line. Dressings should not be changed too frequently.

In the severe crushing injuries extensive débride-ment should be avoided and as much tissue as possible saved. Incisions for counter drainage should be made at dependent parts. Loose ends of lacerated muscle should be excised and small fragments of completely detached bone removed. Nerves and tendons if severed may be repaired at this time. Ruptured joint capsules must be carefully sutured. The fracture should be covered as much as possible with soft tissues. The wound is then flushed out with a weak antiseptic or with normal saline solution and lightly packed with vaseline gauze dressings. A Thomas or a Murray Jones splint is applied and traction attached to the splint. The suspension should all be obtained by counterweights, no part of the splint being tied up in such a manner as to prevent motion with the change of position of the patient.

The measure of success will depend upon the amount of personal attention given to the patient by the surgeon himself. If the case is left to others who do not understand the plan of treatment, irretrievable damage may result.

WILLIAM ARTHUR CLARK M.D.

Bado J. L., Rolli D. V. and Pedemonte P. V.

The treatment of Fractures of the Shaft of the Femur (El tratamiento de las fracturas de la diáfisis del fémur). *Rev. de ortop y traumatol.* 1937 7 91

Only fractures involving the shaft of the femur and intertrochanteric and supracondylar fractures are discussed in this study. Fractures of the neck of the femur are excluded because they merit a separate chapter of discussion.

The technique employed by the authors emphasizes three fundamental principles: (1) immediate reduction; (2) proper immobilization of the limb without immobilization of the patient for a long period of time; and (3) prevention of serious complications which might arise from prolonged incapacitation.

The fracture is reduced as soon as the patient enters the hospital and the diagnosis is ascertained. Traction is made on a pin which is attached to the anterior tuberosity of the tibia or to the femoral condyles. The articulation of the knee is carefully avoided because of the danger of a hemarthrosis.

The femoral condyles are usually more desirable points of attachment and articular damage is more easily avoided if attachment is made thereto. Strict asepsis should be observed during transfexion of the pin. Local anesthesia is never employed because the operation is usually performed quickly and the pain experienced is slight.

The operation is performed with the patient in bed. The limb being placed in a frame which permits traction on the flexed leg and good orientation of the fragments. The frame should also maintain the foot in proper suspension and thus prevent the development of pes equinus. Traction is maintained by the application of weights from 4 to 5 kgm. in children and from 6 to 8 kgm. in adult.

The patient is usually comfortable in this position and no analgesics are required. The weights are gradually increased and progress is followed up by roentgenological control.

The second part of the treatment aims to reduce any persistent overriding of the fragments due to muscle pull. After any such displacement has been corrected a plaster cast is applied with the patient placed in a suitable frame which supports the pelvis and which can be applied in bed. A control roentgenogram is taken immediately after the application of the cast. If it proves satisfactory the patient is removed from the pelvic support and from the frame and lastly the pin is removed after its ends have been disinfected. If the film reveals a persistent displacement however a circular window is cut out of the cast at that site and the displacement is corrected. The plaster cast maintains the reduction of any displacement.

After having immobilized the site of the fracture the patient may begin to walk with the aid of a cane. In the adult this period of immobilization should be prolonged for six or seven weeks, after which time the cast is removed and is replaced by one which extends down to the knee joint leaving the latter free. After another period of six weeks the cast is removed permanently and the patient gradually resumes normal walking.

In a series of 85 patients treated in this manner the authors report excellent results. The period of traction lasted twelve days on the average. Immobilization in the first plaster cast was maintained for a period of six or seven weeks and patients began to walk usually on the ninth day following the application of the first cast.

Patients were kept in the second cast for five or six weeks. In this series the total time of complete incapacitation averaged from six to seven weeks in the child and from twelve to fourteen weeks in the adult. Surgical reduction of the fracture was performed in only about 15 per cent of the cases.

RICHARD E. SOMMA M.D.

Anderson R. The Ambulatory Method of Treating Femoral Shaft Fractures Utilizing Fracture Table for Reduction. *Am. J. Surg.* 1938 39 535

In the ambulatory method of treating fractures of the femoral shaft the superior fragment of the fractured femur is transfixed by means of half pins and the distal fragment is doubly transfixed by Steinmann pins or Kirschner wires. This transfexion (1) supplies skeletal traction and countertraction; (2) furnishes the means for direct manipulation of each fragment; and (3) provides absolute immobilization when incorporated in plaster.

By incorporating the two sets of transfixions in a short plaster cast immediate movements of the knee and hip may be made without disturbing apposition. Crutch ambulation is possible after the patient has recovered from the shock and after the plaster has dried. After being in the hospital a few

days, the patient is able to be up and about, fully clothed, and free from pain during the remainder of the period of convalescence

The traction force for reduction may be obtained by use of (1) the fracture table, (2) the anatomical femur splint, (3) weights and pulleys, or (4) by manual traction

Pain, if present, is usually due to faulty technique. The continued pull of the skin against the transfixions in moving about may, after a few weeks, give some distress accompanied by a sterile, purulent discharge. Another source of distress and discharge may be the bony absorption around the ends of the half-pins. These can be alleviated by keeping the patient off his feet for a few days.

Suppuration and distress around the distal transfixions from sidewise movements may occur on recession of the swelling in those cases in which the two distal transfixions have been inserted parallel to each other. Danger of infection is practically nil.

Deviations from the routine method of treating fractures of the femoral shaft are described for "locked," subtrochanteric, and comminuted fractures.

Compound fractures are débrided and closed primarily, or packed with Orr's vaseline gauze. When the anatomical splint is employed the thigh may be left fully exposed, reduced, and completely immobilized in the splint for as many weeks as desired. With this method the wounds may be chemically lavaged, treated with maggots, or any other method the surgeon elects.

Excellent results in treating fractures of the femoral shaft may be obtained if the many technical details of this new method are carefully followed.

RICHARD J. BENNETT, JR., M.D.

Næraa, A: On Secondary Epiphyseal Necrosis After Collum Femoris Fracture in Young Persons. *Acta chirurg Scand*, 1937, 80: 238

The author describes 2 cases of secondary epiphyseal necrosis in young persons who had had fractures of the neck of the femur which had healed in good position.

The first case was that of a boy who at the age of fourteen years had a fracture of the neck of the left femur. Immobilization was carried on for four weeks, followed by massage and movements. He was discharged from the hospital in six weeks with no pain and normal mobility of the hips. He returned to work fourteen weeks after the accident and has continued to work since that time.

For one year after his discharge there was progressive improvement, but after that time his condition became worse again. Pain was not present during rest but he complained of pain in his left hip when he started walking. In September, 1935, or four years and five months after the original injury, the left lower extremity was found to be $2\frac{1}{2}$ cm. shorter than the right leg. Roentgen-ray examination shows marked changes. There was no sign of a fracture or any change at the site of the former fracture. The

head of the femur was the site of the pathological process. In the upper part of the head just below the lateral brim of the acetabulum, there was a large light area and, medially to this, several small roundish light areas. The head was greatly flattened superiorly while the inferior part was mushroom-shaped. The permanent disability was estimated at 25 per cent.

In the second case, that of a boy aged sixteen, the patient was admitted to the hospital on January 22, 1931. Roentgen-ray examination showed a transverse fracture of the neck of the femur corresponding approximately to the middle. Position was good with no sign of epiphyseal separation. Extension was continued for eight weeks. The patient was up and around in three months.

Roentgen-ray examination on February 21, 1931, showed an ideal position.

Roentgen-ray examination on May 5, 1931, showed some conspicuous changes. The fracture appeared to have healed but now there was coxa valga, the head was flat and the epiphyseal line was almost horizontal.

Roentgen-ray examination on November 17, 1931, showed that the head resembled somewhat the picture of Legg-Calvé-Perthes disease. The neck had grown more rapidly than the head, the latter being very irregular in structure and rather dense, but with several clearings.

One year later the patient was readmitted to the hospital. He had been tending to his work on the farm. The pain kept coming now and then as before, radiating down the thigh, and he limped considerably.

Examination on September 19, 1933, revealed that he was feeling perfectly well and walked about nicely. The left hip was perfectly normal, clinically as well as roentgenologically.

In addition to these 2 cases, 15 cases of this type have been reported in the literature. The lesion is said to occur in every third patient between the ages of fifteen and sixteen years who contracts a collum fracture of the neck of the femur. The lesion is assumed to be identical with certain forms of Legg-Calvé-Perthes disease in as much as it resembles these forms roentgenologically.

Typical of all these cases is good healing and absence of symptoms. The symptoms first make their appearance from six to twenty-seven months after the accident. They are weight-carrying pains, reduced mobility of the hip joint, shortening and, as shown roentgenologically, necrosis of the head with clearings in the overloaded upper brim of the head, flattening, and a mushroom shape of the caput. The disablement has been found to vary between 20 to 50 per cent.

In contrast to what is the rule in old patients, necrosis of the head of the femur in the young takes place in particular in the lateral fracture. The secondary necrosis in young persons is comparable to the frequent total necrosis of the head in medial fractures of the neck of the femur in old persons.

The two conditions differ in several respects above all in the location of the fracture and also in the course of the disease and roentgenographic features. In roentgenograms of this condition in old persons there is never any clearing in the necrotic head on the contrary, it remains dark and dense. On the other hand, there can be no doubt that this affection at any rate morphologically is identical with certain forms of Legg Calvé Perthes disease. Roentgen films show exactly the same picture but this does not mean very much as the pathologic anatomical basis need not necessarily be the same.

As a rule the fracture heals without any complications whatsoever and in good position. It has been demonstrated that in the healing of fractures of the neck of the femur, the resulting scar may act as a barrier which does not allow the blood vessels of the shaft of the neck to go over into the other broken off part of the neck.

With regard to the pathogenesis of Legg Calvé Perthes disease there are three groups of men: (1) those who believe that it is due to an embolic occlusion of a main artery; (2) those who hold that the necrosis is subsequent to traumatic injury of one of the several arteries; and (3) those who believe that hyperemia resulting from the trauma will give rise to decalcification and, from this, to fragmentation of the head which is observed roentgenologically. Microscopy reveals extensive endarteritis amounting in some places to obliteration, and some believe that this condition may be attributable to a traumatic lesion of the blood vessels and be compared to osteochondritis dissecans.

Development has been attributed to weight bearing insufficiency, and this explanation finds support in the circumstance that deep necrosis makes its appearance on that side where the reposition has been successful and where the greater part of the weight has been placed. The head on which no weight is placed does not become the site of Legg Calvé Perthes disease.

The artery passing through the ligamentum teres femoris is not able to maintain the nutrition of the

caput. Recent investigation has shown however that the blood vessels are found through the ligamentum teres in all age classes although in most instances they are able to supply only the areas surrounding the fovea. The size of the blood vessels is rather variable. Nassbaum has shown that complete severing of the synovial capsule in animals gives total necrosis of the fractured head. Another writer has claimed that the same applies to man as well. Comparison has been made between the roentgenographic and the underlying pathological processes. The differential diagnosis and the treatment are discussed briefly. The main point is that femoral fractures of the young are not to be subjected to any particular strain for a long period of time and the patients are to return for re-examination frequently in the first year following the injury.

RICHARD J. BENNETT JR. M.D.

Henry M. O. Fractures of the Patella *Am J Surg*, 1937 38 682

The author discusses briefly the etiology, pathology and diagnosis of fractures of the patella and then describes in some detail his methods of treatment.

Fractures without separation he believes should be immobilized either by a circular plaster cast or by a molded plaster splint for at least four weeks before gentle motion is started. Fractures with separation always associated with tears of the aponeurosis should be operated on. The author prefers a straight transverse incision above the kneeling surface. A strict non touch technique is unquestionably the best. Chemic catgut in mattress suture is satisfactory for repair of the aponeurosis. The bony fragments may be held by rustless steel wire in cerclage. A circular plaster cast is applied and maintained for about six weeks with weight bearing from two weeks after operation. Quadriceps strength must be gained by active contraction as soon as possible. The author lists a number of possible errors in treatment. Illustrations accompany the article.

BARBARA B. STIMSON M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Ratschow, M.: The Conservative Treatment of Peripheral Arterial Circulatory Disturbances (Die konservative Behandlung der peripheren arteriellen Durchblutungsstörungen) *Zentralbl f inn Med*, 1937, pp 817, 834

This article was written by an internist, but it is very important for the surgeon, as its purpose is to show that, before proceeding to amputation or sympathectomy, he should employ all conservative measures

The teaching of Leriche, that a constriction of accessory vessels occurs in inflammatory disease of a main vessel from vasomotor reflex, is of great importance in this connection. Every vascular disturbance which has already led to local tissue change requires unconditionally rest in bed for weeks or months. Ratschow is therefore very skeptical as to the cures obtained with padutin, typhus vaccine, or other remedies when these have been associated with a prolonged rest in bed. In severe cases the patients at first suffer increased pain because of the warmth in bed, but this fact is not a contra-indication to bed rest. Hence, in the beginning large doses of narcotics may be required.

Simple envelopment with cotton wadding is advantageous, but the author warns against the application of external heat in any form. This includes diathermy. The author has had excellent results, particularly with regard to the relief of pain, from the use of hot baths to remote parts, such as arm baths daily, up to 45 degrees, the effect resulting not from reflex heat but apparently from the direct heating of the blood. Temporary relief is obtained by novocaine block of the sciatic nerve or of the cervical ganglia. In the beginning also, Ratschow gives ephyllin intravenously, with resulting freedom from pain of thirty minutes' average duration. It is effective, however, only in the milder cases. This is also true of strychnine, particularly in intermittent claudication. In the more severe cases the intravenous administration, two or three times daily, of papaverine hydrochloride, 0.4, plus theophyllin sodium acetate, 0.4, is effective especially for the relief of pain. Likewise, in the first days, good results may be expected from strophanthin. Moreover, Silbert has noted improvement in 83 per cent of 524 cases following intravenous injections, three times weekly, of from 150 to 300 c cm of a 5 per cent sodium-chloride solution if given over a period of weeks or months.

A very modern method of vascular treatment is the alternating suction and compression by means of an electric pump, alternating a negative pressure of 80 mm Hg with a positive pressure of 20 mm Hg for periods of from five to seven hours (Hermann). At least 100 treatment hours are necessary.

Ratschow considers this treatment to be an indispensable hospital equipment.

Treatment with leeches is contra-indicated in arterial circulatory disturbances although it is beneficial in thrombophlebitis. Very good results were obtained from local injections of acetylcholine, 1 gm to 5 c cm of a 1 per cent novocaine solution, around the entire diseased area, even infiltration of the entire foot. Immediate relief of the severe pains was obtained for from five to six hours.

Ratschow has seen no demonstrable effects from padutin, eutonin, and other tissue extracts. In the not infrequent arterial circulatory disturbances of polycythemia, he warns particularly against eutonin.

He also employs roentgen treatment as an adjunct. For the arm it is applied 2 cm to the right and left of the cervical spine and the two upper thoracic vertebrae, for the leg, in an area of 12 cm from the tenth dorsal to the fifth lumbar vertebra, with half-penetrating, moderately filtered rays. However the result is apparent only after one or two weeks.

For the resumption of use of the diseased limbs, he recommends the dynamometer as a guide to determine when the patient may be permitted to stand. Necrotic terminal phalanges should be permitted, if possible, to separate spontaneously. For rapid mummification he recommends 40 per cent formalin.

The intra-arterial injection of iodine-salt solutions, abrodil or uroselectan, in conjunction with arteriography, is to be employed only if all conservative measures have failed, for, according to Sgalitzer, amputation may be avoided in one-third of the cases. On the other hand, these substances may cause severe vascular spasms.

(FRANZ) J M SALMON, M D

Fagarasanu, I.: Anatomical Study of the Left Renal Vein and Its Collaterals; Their Relation to the Pathogenesis of Essential Varicocele and Varices of the Broad Ligament (Recherches anatomiques sur la veine rénale gauche et ses collatérales, leurs rapports avec la pathogénie du varicocele essentiel et des varices du ligament large) *Ann d'anat path*, 1938, 15, 9

Fagarasanu reports an anatomical study of the left renal vein, its afferent veins, and efferent, or collateral, venous channels in 71 subjects of both sexes, including adults and fetuses.

The left renal vein differs in its embryological origin from the right renal vein; anatomically it is longer than the right vein and receives important afferent veins, while only a few small afferent veins enter the right renal vein. Normally the left renal vein passes in front of the aorta, in only 5 of the 71 cases was it found behind the aorta. The vein may pass obliquely upward to enter the inferior vena

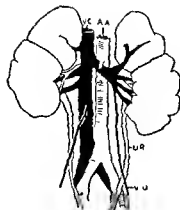


Fig 1

Fig 1 Left renal vein ascending obliquely (type 1) right renal vein double (fetus)

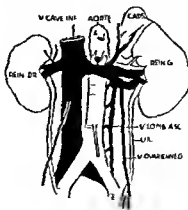


Fig 2

Fig 2 Transverse renal vein (type 2)
Fig 3 Triplicate collateral circulation of the left vein

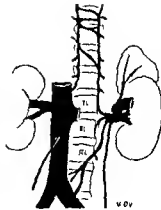


Fig 3

cava above the right renal vein as was observed in 42 or 67.6 per cent of the 71 subjects; it may run horizontally and enter the vena cava at a right angle as found in 23 or 32.3 per cent or it may pass obliquely downward to enter the vena cava below the right renal vein as in 5 or 7 per cent. The superior mesenteric artery and Treitz's muscle pass

in front of the left renal vein. These two structures as well as the anatomical structures surrounding them such as the lymphatic glands, nerve ganglia and sympathetic nerve fibers of the superior mesenteric plexus may press upon the vein and interfere with the circulation and create a condition of hypertension in all the venous system connected with this vein. Minor signs of such chronic stasis which is to some extent physiological are an increase in the weight of the left kidney and testicle which normally weigh a little more than these organs on the right side and a lower position of the left testicle which is normally lower than the right. When this venous hypertension is increased beyond the physiological limits pathological symptoms may result.

The left renal vein is supplied with an extensive collateral circulation in the form of efferent venous channels which normally maintains the venous circulation among 71 subjects such a collateral circulation was lacking in only 6. The right renal vein is rarely supplied with any such collateral circulation. These collateral veins show marked variability in their size and form. 9 different types are described and illustrated. In cases in which these collateral venous channels were lacking or were relatively few it was noted that the left genital vein and its plexus were much more dilated than the corresponding venous channels on the right side and sometimes tended to the formation of a varicocele.

These anatomical findings do not fully explain why varicocele and varices of the broad ligament occur only on the left side and only when the sex glands are most active. The author is of the opinion that these developments are due primarily to another difference between the left and the right renal vein, the fact that the adrenal vein on the left enters the renal vein but that on the right side passes directly into the inferior vena cava. Therefore the adrenaline from the adrenal medulla is discharged

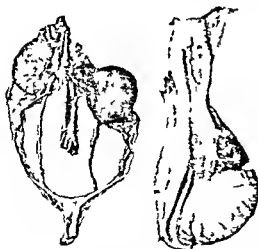


Fig 4



Fig 5

Fig 4 Incomplete ligature of the left renal vein above the point of entrance of the ovarian vein (in a dog) marked dilatation of the latter with varices of the broad ligament

Fig 5 Varicocele in a dog; the animal was killed two months after an incomplete elastic ligature of the left renal vein

directly into the left renal vein in close proximity to the point of entrance of the left genital vein. The adrenaline has a hypertensive action on the left renal vein and its afferent veins, which adds to the circulatory stasis in this venous system resulting from the pressure of the superior mesenteric artery and Treitz's muscle. The secretion of adrenaline is more active during the period of life when the production of sex hormones is greatest.

Experiments are reported on dogs in which it was found that complete obstruction of the left renal vein by ligatures resulted in the death of the animal. However, when the left renal vein was incompletely obstructed, 4 of 5 animals survived. In these 4 animals, which were killed at varying intervals after such incomplete obstruction, varicoceles or varices of the broad ligament were found in all cases.

Varicocele is a condition that is specific for man. It is due to his erect position, which increases the pressure on the renal vein by the surrounding structures. This indicates that this venous system is not always capable of adjustment to orthostatism.

ALICE M. MEYERS

Seiro, V.: The Blood Pressure and Circulation in Varicose Veins of the Lower Extremities (Ueber Blutdruck und Blutkreislauf in den Krampfaderen der unteren Extremitäten). *Acta chirurg Scand*, 1937, 80: 41.

The author has investigated the blood pressure in the cutaneous veins of the lower limbs. He made punctures and then used a glass-tube manometer. He examined patients with varicose veins as well as persons without pathological changes in the veins. The results derived from the investigation of persons in the erect position are of the most interest. He found that the level of the manometer fluid rose about to the level of the heart projection, in most cases to the insertion of the fourth or fifth rib cartilage, seldom any lower. The findings were approximately similar in persons with and without varices. The fluid level of the manometer rose to the same height as when the venous pressure was measured. The absolute pressure depends on the site of the puncture and the height of the investigated subject. The main factor of the venous pressure in a person standing at ease is undoubtedly the hydrostatic pressure.

Certain physiological features cause variations in the pressure of the cutaneous veins. Most important are respiration and muscular activity of the limbs. Deep inspiration lowers the pressure, deep expiration raises it. Activity of the muscles in the limbs lowers the pressure in the vein. The fall of pressure is dependent on the competence of the valves in the cutaneous veins. If the valves are intact the fall is considerable, if incompetent, the fall is less noticeable. If, in the latter case the vena saphena magna is compressed above the site of puncture and the subject makes continuous walking movements, the pressure falls, nearly to the same level as in intact veins. This supplies us with a

method of ascertaining whether the valves of the vena saphena magna are competent or not.

If, in a patient with varices, erect and at ease, the pressure is measured at two different levels and in the errors caused by the specific weight of the fluid in the measuring instruments are eliminated, the fluid level of the femoral manometer is higher than that of the antecubital. By using hypodermic needles and a narrow tube system, local blood circulation can be produced between different parts of the vena saphena magna, the flow only being influenced by the difference in pressure between the sites of puncture. In this case the blood always flows into the tube system from above. In the opinion of the author, these investigations confirm that, in those varicose veins where the valves are incompetent, the circulation is paradoxical even with the subject standing erect and at ease. This paradoxical circulation, however, is not constant either in direction or power. It resembles a slightly undulating movement, alternately faster and slower, at times quite still. By these experimental observations the author has thrown light on the importance of the vessels in the venous circulation of the limbs.

The blood in the venous circulation of the lower limbs flows from the cutaneous veins through the anastomosing vessels into the deep veins and leaves the limbs through the latter. This is certain during muscular activity, and probable in an erect person at ease.

The results of these observations lead the author into certain theoretical discussions on the subject of the pressure in the deep veins, the physiological factors influencing the circulation in the veins, the etiology of varicose veins, and the symptoms caused thereby. These must be read in the original article.

Voegt, H.: Changes in the Muscles of the Calf in Venous Thrombosis and after a Prolonged Stay in Bed (Veränderungen der Wadenmuskulatur bei Venenthrombose und langem Kranklager). *Arch f path Anal*, 1937, 300: 190.

In many cases of bedridden patients one can observe an atrophy of the muscular apparatus of the calf. The purpose of the present treatise is to determine whether this muscle degeneration is caused by pressure, disuse, or by venous thrombosis of the calf. Of 33 patients, all with a prolonged stay in bed, 5 had venous thrombosis of the calf. Two cases, those of 2 suicides, were used as controls. Parts of the flexor muscles of the leg, of the muscles of the gluteal region, of the biceps of the arm, and of the large abdominal muscle were examined.

It was not possible to establish any difference between the cases with thrombosis and those without thrombosis, without exception there were severe changes in the muscles in the sense of degeneration and atrophy, the transverse striation was often hard to recognize, and the muscular fibers were characterized by fatty degeneration. Furthermore, there was fibrillary segmentation and proliferation of the nuclei. Frequently, the changes in cases

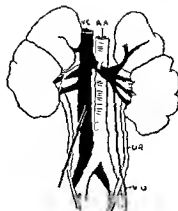


Fig 1

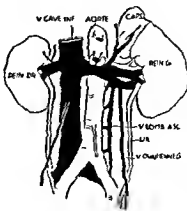


Fig 2

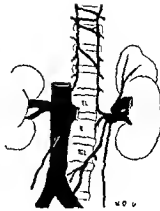


Fig 3

Fig 1 Left renal vein ascending obliquely (type 1) right renal vein double (fetus)

Fig 2 Transverse renal vein (type 1)
Fig 3 Triplicate collateral circulation of the left vein

cava above the right renal vein as was observed in 42 or 67.6 per cent of the 71 subjects it may run horizontally and enter the vena cava at a right angle, as found in 13 or 18.3 per cent or it may pass obliquely downward to enter the vena cava below the right renal vein as in 5 or 7 per cent. The superior mesenteric artery and Treitz's muscle pass

in front of the left renal vein. These two structures as well as the anatomical structures surrounding them such as the lymphatic glands, nerve ganglia and sympathetic nerve fibers of the superior mesenteric plexus may press upon the vein and interfere with the circulation and create a condition of hypertension in all the venous system connected with this vein. Minor signs of such chronic stasis which is to some extent physiological are an increase in the weight of the left kidney and testicle which normally weigh a little more than these organs on the right side and a lower position of the left testicle which is normally lower than the right. When this venous hypertension is increased beyond the physiological limits pathological symptoms may result.

The left renal vein is supplied with an extensive collateral circulation in the form of efferent venous channels which normally maintains the venous circulation among 71 subjects such a collateral circulation was lacking in only 6. The right renal vein is rarely supplied with any such collateral circulation. These collateral veins show marked variability in their size and form. 9 different types are described and illustrated. In case in which these collateral venous channels were lacking or were relatively few it was noted that the left genital vein and its plexus were much more dilated than the corresponding venous channel on the right side and sometimes tended to the formation of a varicocele.

These anatomical findings do not fully explain why varicocele and varices of the broad ligament occur only on the left side and only when the sex glands are most active. The author is of the opinion that these developments are due primarily to another difference between the left and the right renal vein the fact that the adrenal vein on the left enters the renal vein but that on the right side passes directly into the inferior vena cava. Therefore the adrenaline from the adrenal medulla is discharged



Fig 4



Fig 5

Fig 4 Incomplete ligation of the left renal vein above the point of entrance of the ovarian vein (in a dog) marked dilatation of the latter with varices of the broad ligament.

Fig 5 Varicocele in a dog the animal was killed two months after an incomplete elastic ligation of the left renal vein.

several other conditions there also is hemorrhage due to disturbance of the blood chemism, as in the diseases of the liver and bile passages which are so important to the surgeon. Numerous cases of poisoning likewise show a tendency to hemorrhage. The clinical picture of all hemorrhagic diatheses shows that the vessels are of primary importance in the causation of bleeding. After extirpation of the spleen, in spite of thrombopenia, one never sees hemorrhage, and normal bleeding time is the rule. At other times disturbances of the vessels alone may cause bleeding. Whether there is only an increased permeability of vessels of a mechanical nature in hemophilia or whether there are other complicating factors present we are still unable to state. There is considerable evidence that there is an abnormal behavior of the entire osseous and blood-forming glandular system.

The four groups of hereditary thrombopathies. The degenerative platelet picture, the platelet anothocytosis, as well as the variability of the forms are so typical that at times from the blood slide alone the diagnosis of thrombasthenia of Glanzmann can be made. As the Willebrand type of constitutional thrombopathy presents clinical pictures similar to those of the type described by Morawetz and Juergens (sporadic thrombasthenia), the cases occurring in the Finland families may be similar to those occurring sporadically in Germany. The Finland cases which were investigated are spread over 3 large bleeder families with 76 persons who show a tendency toward bleeding. A definite picture of inheritance could not be established as there were long periods of latency before the bleeding started.

The first manifestations of bleeding tendencies at times show themselves already in infancy; even during childhood hemorrhages may occur even after minute traumas. Usually dental changes and puberty phenomena may bring on bleeding. Hemophilic bleeding occurs only in the male. Menstruation even in a person with a definite tendency toward bleeding may be normal, but occasionally it causes death. The most frequent sites of the bleeding are the nose, skin, and mucous membranes, but bleeding from the gums, stomach, and bowel may occur, occasionally a joint may bleed. Infections seem to predispose to bleeding. Racial characteristics and intermarriage favor bleeding.

The platelets of the thrombopathy are different from those of hereditary thrombasthenia. In all cases of constitutional thrombopathy the plasma albumen bodies were normal. The bleeding tendency in constitutional thrombopathy, in spite of a normal number of platelets, is caused by a lower function of these platelets.

The Naegeli type occurs in Switzerland and is similar to the hereditary type of Glanzmann. The red and white blood cells are normal, also the thrombocyte count. There is a preponderance of the small platelets, but very poor coagulation.

The Juergens type of mid-Germany presents the following symptoms: spontaneous skin hemorrhages,

or hemorrhages following minimal trauma, such as pressure or skin crushing. In questioning the patients it will be found that these tendencies have existed since the earliest childhood days, and are probably due to vascular changes. Ten cases are presented.

The best treatment for the bleeding tendency is early and repeated blood transfusion. In mild cases injection of the patient's own blood should be done, or injections of serum, gelatin, calcium, and the new preparation A T 10 may be made with care. There is no indication for extirpation of the spleen as there is no enlargement of that organ as in cases of thrombopenia. (A. FRAENKEL). LEO A. JUHNKE, M.D.

Rø, J.: Specific Group Reactions after Blood Transfusion (Ueber Gruppenspezifische Reaktionen nach Bluttransfusionen). *Acta chirurg Scand*, 1937, 80: 283.

The author reports an instance of blood transfusion from Group A to O with subsequent hemolysis but final recovery. The preliminary measures consisted in an individual agglutination test which was negative. The author carried out a series of follow-up studies and discovered that the recipient belonged to a defective O type whose blood contained hemolysin α but not agglutinin α . Two days after the blood transfusion a strong agglutinative capacity of Group A became evident. The agglutination titer rose to 200 in the course of the first five weeks and fell to 70 in the following four weeks. This new characteristic apparently arose from a combination of two factors, an agglutination factor embracing the entire Group A and a more specific individual factor having to do with the donor in question. The former of these factors could be absorbed by ordinary A blood corpuscles but the latter only by the blood corpuscles of the donor.

These new characteristics must be due to an irrelative action on the blood-forming organs of the recipient due to the transfused blood. They do not by any means signify a transition to a new group but rather only a completion or increase of congenital latent group characteristics.

In a critical study of the direct preliminary tests and their clinical value, the author shows that the biological test can be wrong. The agglutination test is not sufficient. It must be supplemented by a hemolysis test and a group determination. These preliminary measures must be undertaken anew before each blood transfusion as the blood of a previously suitable donor may lead to dangerous complications at a later transfusion.

Rein, C. R., Wise, F., and Cukerbaum, A. R.: The Control and Prevention of Transfusion Syphilis. *J Am M Ass*, 1938, 110: 13.

The authors point out the rapid increase in the number of transfusions in the last few years, and state that the reason for this increase is the better protection that is given the recipients by a more careful selection of donors, and the safeguards ren-

without thrombosis were more pronounced than those with thrombosis, there was always a distinct difference between the muscles of the gluteal region and the abdomen. The degeneration is probably caused by pressure, disturbance in the circulation, disuse atrophy or a combination of these factors. Herein is a basis for a theory of the origin of thrombosis in general as the products of disintegration arising from the destruction of the muscles may be responsible for the condition. From this theory arises the possibility of prophylaxis of thrombosis in the form of motion therapy which would remove at the same time the disturbances in the circulation which play an important part in thrombosis.

(G BEYER) CLARENCE C REED M.D.

Roessle R. The Significance and Development of Thrombosis of the Veins in the Leg (*Ueber die Bedeutung und die Entstehung der Wadenvenen thrombosen*). *Arch f path Anat* 1937 300 180.

One of the most important questions in the problem of thrombosis is the site of development. According to Virchow and Aschoff, thrombosis develops most frequently in the pelvic veins and then in the femoral vein. Denecke and Payr stated that thrombosis occurred most frequently in the veins of the leg and of the soles of the feet. The author then investigated this condition in a great number of cadavers and found thromboses of the leg veins in 25 per cent of all cases. He did not investigate the veins in the soles of the feet. In most instances the thrombosis in the veins of the leg occurred alone or in conjunction with thrombosis of the femoral vein, only in isolated cases femoral thrombosis without thrombosis of the leg was found. In the neighborhood of the thrombosis of the leg there was frequently marked degeneration of the musculature in the form of liposis, cloudy swelling and absence of the transverse striations. The question arises whether the muscle damage is a cause or a result of the thrombosis or just an associated phenomenon. There are factors pointing toward each possibility, but nothing definite can be said at present. Why thrombosis occurs in the leg veins and why this is the most frequent site remains to be investigated. Factors which may be responsible are a disturbance in the blood flow which is definitely present and the catabolic products from the muscle degeneration. To the surgeon it is important to know the relation of this thrombosis to embolism. Embolism in the leg veins is relatively rare but on account of the clinical and anatomical extent of thrombosis of the leg this condition assumes considerable importance.

(G BEYER) LEO A JUERGEN M.D.

BLOOD TRANSFUSION

Juergens R. Hereditary Thrombopathies (*Die erblichen Thrombopathien*). *Festschr d allg Med u Kinderh* 1937 53 793.

Under the name of hereditary thrombopathies four clinical groups of conditions are considered:

(1) the hereditary hemorrhagic thrombasthenia of Glanzmann (2) the constitutional thrombopathy of von Willebrand and Juergens (3) the Naegeli type of thrombopathy of Switzerland and (4) the Juergens type of middle Germany. All observations on cases mentioned in the literature were made in family groups. Heredity could be traced through several generations. This variety of bleeding tendency occurs much more frequently than heretofore supposed. Numerous patients considered as female hemophiliacs surely belong to this group. Considerable importance is attached to an accurate history, to location of the bleeding and to the varying tendency toward hemorrhage during the different ages of the patient. The clinical picture is more important than the blood picture.

Methods of investigation are described in detail. They should embrace:

The hemoglobin determination. The number and differentiation of the erythrocytes, the number of the reticulocytes after staining with vital stain—determination of the differential count of the leucocytes according to the Arneil Shilling method.

The platelet count. The number of the thrombocytes in the venous blood according to the Thomsen method, the number of the thrombocytes according to the Juergens method (micro-skin blood method). The important factor of this method which is described in detail, lies in the fact that the blood is obtained from a simple puncture of the skin and an immediate count is made.

Investigation of the platelet function with the capillary thrombometer according to the method of Morawetz and Juergens.

The qualitative platelet picture. In addition to the counting of the thrombocytes and the testing of their function (the morphological changes of the platelets must also be observed). Juergens has therefore investigated the platelet picture for the different blood diseases and has devised a developmental order for the thrombocytes analogous to that of the erythrocytes and leucocytes. From the findings forms of thrombocytes can be identified which will correspond to the clinical picture of the blood disease in question. They are immature early forms so called blue platelets in the course of thrombopenia, hemophilia and polycythemia, degenerative forms observed in thrombasthenia, thrombopenia and in myeloblastic leucemia, pathological irritation forms as large and bizarre platelets in polycythemia and stock forms (thromboblasts) which characterize the platelet picture in fully developed leucemias.

Examination of the serum of the blood.

Investigation of the vessel factor.

Pathology of the bleeding tendency. As an example of the injury to the blood chemistry, hemophilia comes first, but considerable significance must be attached to the blood vessels in the production of the bleeding. Even in cases of delayed coagulation induced experimentally in the animal with hirudin and heparin we must accept increased permeability as an important factor if hemorrhage should occur. In

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Thompson, W. D., Ravdin, I. S., and Frank, I. L.:
The Effect of Hypoproteinemia on Wound Dis-
ruption. *Arch Surg*, 1938, 36, 500

The fairly common rupture of abdominal wounds with or without evisceration, especially after upper abdominal incisions for operations upon the biliary or upper intestinal tracts, appears to the authors to be associated with hypoproteinemia. They point out that the poor nutrition of such patients together with the large amounts of sodium chloride given intravenously may result in a very low level of serum protein.

Eleven dogs were used in a study of the effect of such hypoproteinemia on wound healing. The serum proteins were reduced by diet and plasmapheresis, and 2 incisions 8 cm long were made through the rectus muscle into the peritoneal cavity. One wound was closed with silk and the other with No. 1 chromic twenty-day catgut. In this series disruption of the wound or failure to heal was noted in 8 cases, an incidence of 72 per cent. When biopsies were made, the tissue was found to be unhealthy looking, and serous fluid could be expressed from the wound as late as fourteen days after the initial operation. The tissue was edematous, glistening and pale, bled poorly, and showed little attempt at union. The same condition presented itself in the case of sections taken from skin, muscle, fascia, and omentum, the histological picture was that of marked delay in tissue repair.

It is true that there are many factors other than hypoproteinemia associated with wound disruption. Yet, when these other factors are considered and controlled as in the present experiments, there remain wounds in which failure to heal must be due to general, more widely acting causes. Hypoproteinemia is one of these causes which can in many instances be largely controlled. The authors have corrected it by the use of repeated transfusions and by the use of a protein hydrolysate administered by proctoclysis.

JOHN WILTSIE EFTON, M.D.

Thompson, W. D., Ravdin, I. S., Rhoads, J. E., and Frank, I. L.: The Use of Lyophile Plasma in the Correction of Hypoproteinemia and the Prevention of Wound Disruption. *Arch Surg*, 1938, 36, 509

The authors report experiments to show that the delay in the healing of wounds in hypoproteinemic dogs may be prevented by promptly restoring the serum protein to a normal level and maintaining this level during the period of healing.

When the serum protein in dogs was reduced to the desired level and roentgenographic studies demonstrated a marked reduction in the emptying time of

the stomach, operation was performed on the dogs. After the operation the animals were maintained on a low protein diet and each animal was given intravenously approximately 300 c cm of lyophile plasma daily on six days of the first week after operation and approximately 150 c cm daily on four days of the second week. Specimens were taken from the wounds on the seventh and fourteenth postoperative days.

The authors gave in detail the method of preparing the lyophile serum. It was shown that the strength of No. 1 chromic catgut placed in the abdominal wall of normal dogs for four days when the serum protein was normal was 40.7 per cent, while the strength of the same type of catgut in the same dogs when afflicted with hypoproteinemia, for the same period of time, was 55.6 per cent.

The authors concluded that it was advisable to use a non-absorbable suture material in cases of protein deficiency. They found that the retardation in the healing of wounds associated with hypoproteinemia in dogs can be averted by restoring the serum protein to a normal level immediately after operation.

ROBERT ZOLLINGER, M.D.

Ostrowski, W.: Disturbances of the Function of the Diaphragm in the Postoperative Period (Troubles de fonctionnement du diaphragme dans la période postopératoire). *Arch. méd.-chir. de l'appar. respir.*, 1937, 12, 277

Ostrowski notes that the cause of early postoperative pulmonary complications, bronchitis, atelectasis, and bronchopneumonia, has not yet been determined, and hence the enforcement of effective measures to prevent such complications has met with difficulties. Some interference with the respiratory function appears to be unavoidable in the more extensive surgical procedures.

The author studied the degree of elevation of the diaphragm with the aid of the fluoroscope in 73 patients before and after operation. The 73 patients were divided into 3 groups. The first group included 26 patients, 17 males and 9 females, with surgical conditions of the extremities, the second group, 28 patients, 14 males and 14 females, with chronic diseases of the abdominal organs, such as hernia, ulcer, and cancer, the third group, 19 patients, 11 males and 8 females, with acute abdominal conditions, such as acute appendicitis, perforation, and ileus. In all the cases of the first group, the diaphragm at inspiration reached the upper border of the sixth rib or a still lower level. In 5 cases (18 per cent) of the second group and in 8 cases (42 per cent) of the third group the diaphragm at inspiration did not reach the level of the sixth rib. The respiratory movements of the diaphragm were, therefore, definitely restricted before operation in the third group, or those patients with acute ab-

dered by the more sensitive serological tests, combined with marked simplification in technique

That transfusion syphilis is far more frequent than is indicated by the literature (63 reported cases) is amply demonstrated by the statement that in the practice of four of the authors' colleagues, 19 unreported cases have occurred. It is also shown that the lax requirements of many hospitals permit the giving of doubtful blood to patients. The Kline diagnostic and exclusion tests are very specific and may be performed with a minimum of effort.

Regarding the serological control of syphilis in professional donors reports from 64 hospitals in New York City were as follows: 20 per cent of the hospitals made blood tests on all professional donors immediately before the transfusion, 3 per cent made these tests when they had the time, and the remaining 77 per cent depended on blood tests made at stated intervals of from one to six months. The latter is poor protection, since it is well known that extragenital or concealed lesions may occur without the knowledge of the donor and, in any case, the disease that may have been contracted since the previous test would be more transmissible than otherwise.

The authors suggest that (a) the blood group of all volunteer donors be established and all profes-

sional donors be regrouped, (b) the suitability of the donor's blood for the recipient be determined by cross matching, (c) the presence of syphilis be detected by means of the very sensitive and specific Kline diagnostic and exclusion flocculation tests, and (d) any clinical evidence of syphilis be detected by means of an adequate physical examination.

A method is described whereby typing, cross matching, and a Kline diagnostic and exclusion test are done in thirty minutes on a single microscopic slide with blood from the finger tip of the donor. A microscopic slide measuring two by three in. is provided with five chambers. Two of these chambers care for the typing of the donor in the usual manner. In one the recipient's serum is mixed with the suspension from the donor's cells, thus providing a cross matching check on the suitability of the donor. The remaining two chambers are used for the Kline tests. Five hundredths cubic centimeters of activated (ten minutes in a water bath at 56° C.) donor's serum is placed in each of these chambers. 0.008 c.c. of diagnostic antigen emulsion is added to one and the same quantity of exclusion antigen is added to the other. The slide is rotated for four minutes and then read under the low power of the microscope.

THOMAS C. DOLGLASS, M.D.

The author states that the predominating complication following cranial trauma is a bilateral bronchopneumonia with either isolated or confluent foci and a distinct tendency toward hypostatic phenomena.

In view of the results obtained from this study the author is inclined to believe that in patients with cranial trauma there are, generally speaking, no conditions predisposing to pulmonary involvement. Pathogenetically, these rare cases of true pneumonia are probably due to circulatory alterations caused by the original injury. These disturbances, in turn, produce a local lowering of the resistance favorable to the inoculation of pathogenic organisms which are normally found in the upper respiratory tract.

However, when pneumonia develops late and the patients are of an advanced age, the probability of a hypostatic involvement should be strongly considered, especially because the patient is usually unconscious and in a prolonged decubitus, factors which are notoriously favorable for the development of a hypostatic pneumonia.

RICHARD E. SOMMA, M.D.

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Ghetti, L.: Lesions Produced by the Electric Current (Sopra lesioni prodotte da corrente elettrica) *Arch ital di chir*, 1937, 47, 505

The effects of electricity on the body will vary with a multiplicity of factors, among which are to be considered the type of current, direct or alternating, the mode of contact, the line of travel through the body, the degree of insulation, the electrical resistance of the body tissues, and the constitution of the individual, as well as co-existing maladies, such as cardiac disease.

The concept that a high-tension current kills has been used in carrying out capital punishment. This concept does not always hold true, however. Thus, in America experience has shown that an alternating current of from 1,500 to 2,000 volts of 130 cycles has not resulted in sudden death. Experience has led to a definite procedure, namely a 2,000 volt current of 50 cycles for 7 seconds, which is dropped to 400 volts for 30 seconds and terminated by 2,000 volts for 15 seconds. The first current produces unconsciousness, the second causes cardiac paralysis, and the third induces respiratory paralysis and certain death. It has been repeatedly reported that high-tension currents have caused only temporary disturbances, while the low-tension current in general domestic use has caused the majority of deaths and serious injuries. The author has presented conflicting views of various authorities in this field. Battelli and Prevost believe that the low-tension current damages the heart, while the high-tension current stops respiration. A number of other authors, Dantín, Schulf, Durand, and Lichtenstein, believe that the electricity acts on the centers of the central

nervous system which control the heart and respiration. Jellinek, Kaplan, and MacLachlan state that frequently electricity induces only *apparent* death, and prolonged artificial respiration will restore life. Autopsies on those dead from electricity have demonstrated a variety of changes, such as hyperemia and stasis in the lungs and meninges, hemorrhages in the brain and medulla, cerebral edema, and increased pressure of the cerebrospinal fluid. Thus Schwarz has reported a hemiplegia which occurred twelve hours after a shock by a 220-volt current. As an after-effect one may show paralysis and paresis. Langworthy and Corrado have reported lesions in nerve cells traversed by an electric current. An electric current sufficient to cause caloric changes may cause a necrosis of the muscular fibers of the media of blood vessels followed by fibrous changes.

MacMahon and Pietrusky reported that in their experiments they found it difficult to kill an animal with the high-tension current, but had no difficulty with low-tension currents of from 120 to 1,000 volts. At autopsy Pietrusky found hyperemia and hemorrhage in the viscera, laceration of the cardiac muscles, lesions in the nerve cells and fibers, and lacerations of the spleen. Schlomka and Schrader have observed lesions in the coronary arteries and tetanic spasms of the respiratory muscles. Koeppen reports that death from electricity is due to a strong dilatation of the entire peripheral vascular structure, arrest of the circulation, marked contraction of the arteries, and cardiac paralysis. Montemartini has observed hemorrhages in the muscularis and submucosa of the stomach in animals killed by electricity. Siroli, who used alternating currents of 420, 250, and 190 volts in his experiments, reported hemorrhage and tears in the cardiac muscles, emphysema, hemorrhage, and congestion in the lungs, dilatation of the central lobular veins of the liver and focal hemorrhages in the parenchyma, focal necrosis in the pancreas, glomerular hemorrhage and epithelial degeneration of renal cells, loss of striation of muscle tissue, and vacuolization and diffuse chromatolysis in the nerve tissues.

The literature has indicated a variety of lesions and after-effects from exposure to the electric current. However, the type of current, the voltage and amperage, the duration, the condition, and the resistance have not been given.

The author experimented on rabbits of medium age and of a weight of 2 kgm. He could vary his electrical tension from 90 to 290 volts, and could increase it by a transformer to 1,160 volts. He used an alternating current of 50 cycles. A series of 18 animals were killed by electricity of various voltages. Careful autopsies were performed and the tissues studied histologically. The author could kill a guinea pig with 1 shock of 150 volts for 10 seconds. With higher voltages, from 500 to 1,050, he had to use 3 or 4 shocks for from twenty to thirty seconds. After exposure to high-tension currents there was complete restoration to normal, which indicated that there was no serious injury to the tissues. The chief

dominal conditions. The first postoperative examination of the position of the diaphragm was made from seven to ten hours after operation in 55 cases and from thirty to thirty six hours after operation in the remaining cases. Examinations were repeated daily thereafter until the excursions of the diaphragm became normal.

In the first group there were only 8 patients (31 per cent) in whom the elevation of the diaphragm was greater on inspiration after operation in these patients the elevation was slight not exceeding 2 or 3 cm. In most of these cases the diaphragmatic movements became normal after the second day. In the second group there were 20 patients (71 per cent) who showed a very definite elevation of the diaphragm on inspiration in most of these cases the diaphragmatic movements became normal before the fifth postoperative day. In the third group the operative procedure had a definite effect on the movements of the diaphragm in all cases there was a definite elevation of the diaphragm above the pre-operative level on inspiration. The condition did not become normal until after the fifth day in most instances. In all these groups the position of the diaphragm on expiration was practically normal. This postoperative elevation of the diaphragm was observed in patients operated upon under local as well as under inhalation anesthesia.

A study of the chest expansion during inspiration in these patients showed that after operation in 5 cases of the first group chest expansion was diminished on an average of 22 per cent. After operation in 20 of the 28 patients of the second group chest expansion was diminished on an average of 53 per cent. In all the cases of the third group chest expansion was diminished on an average of 45 per cent. In all instances the diminution in chest expansion paralleled the degree of elevation of the diaphragm. It was evident that the diminished function of the diaphragm was not compensated for by an increased action of the other respiratory muscles. On the contrary all the respiratory muscles functioned less actively on inspiration so that the position of the thoracic cage during inspiration approached that of expiration. The disturbance of the function of the diaphragm was at a maximum in those cases which most frequently showed pulmonary complications.

It was found that lipiodol introduced into the bronchial tree was eliminated much more slowly in animals in which elevation of the diaphragm was produced either by phrenico-exeresis or by pneumoperitoneum than in normal controls. Cough was less effective in expelling the lipiodol and normal absorption was also delayed.

These findings the author concludes indicate that elevation of the diaphragm with restriction of its movements such as occurs after abdominal operations especially definitely interferes with the normal drainage of the respiratory tract. It may therefore be regarded as one of the important etiological factors of early postoperative pulmonary complications.

ALEX M. MEYERS.

Hollinger P H. Bronchoscopy in Postoperative Pulmonary Complications. *Surg Clin North Am* 1938 18 237

Postoperative pulmonary complications present a variety of problems. The author gives a very complete case reports on definite intrabronchial obstruction which occurred following some surgical procedure. The nature of the obstruction varied but the ultimate result if the obstruction was not relieved was always the same namely atelectasis and suppuration beyond the point of obstruction. The author points out that therapy in these cases must be directed toward relieving the bronchial obstruction and releasing the secretions which have formed beyond it and thus establishing drainage to the infected areas.

PAUL MERRILL, M D

Astuni A. The Frequency and Pathogenesis of Pneumonia Following Cranial Trauma (*Frequenza e patogenesi della polmonite da trauma cranico*). *Prat chir* 1937 5 3

Astuni states that according to the reports in the literature a high percentage of patients with a pre-existing cranial trauma succumb to a complicating pulmonary involvement. It has been stated that in about 28.93 per cent of patients who have a cranial trauma or who have undergone craniotomy for a cerebral tumor death does not occur as the direct result of the trauma but rather as the result of a pulmonary edema. The author found that these complications occurred within twenty four hours in 48.38 per cent of his cases. In his opinion these pulmonary complications may be due to a hyperexcitation of the higher sympathetic centers.

As early as 1871 Brown Sequard had shown that artificially produced bulbar lesions cause pulmonary edema in surviving animals shortly after induction of the trauma. Lesions produced at higher levels such as the pons, cerebral or cerebellar peduncles and cerebral hemispheres cause frank pneumonic processes usually at the opposite side of the lesion.

After having briefly reviewed the literature on this subject the author reviews the vast material in his clinic. Among 443 cases of cranial trauma there were 156 (36.79 per cent) with negative findings at autopsy. A simple pulmonary congestion was found in 124 cases (27.99 per cent) pulmonary edema occurred in 120 cases (28.30 per cent) and a true pneumonia was observed in only 24 cases (5.66 per cent). The number of cases of true pneumonia following cranial trauma therefore is relatively scarce in this series. Furthermore from this group of patients there should be excluded all those in whom the pneumonia might have been due to other factors such as septic focal infection or direct thoracic trauma. When such factors are taken into consideration the cases of true pneumonia are exceedingly few. The author believes that the reason for this is the fact that in patients with severe cranial trauma a pneumonic process does not usually develop because death occurs within twenty four hours.

of the spinal cords of dogs, under direct vision. By this method it was possible to produce pure tactile reflex motor tetanus without accompanying tetanus dolorosus or muscular rigidity. There was an incubation period of from twenty-six to seventy-two hours before the onset of the signs of reflex motor tetanus, the area of involvement remained localized, suggesting that a spread of the toxin within the cord did not occur, in 8 control animals in which innocuous substances were injected no signs developed. All of the 11 dogs receiving calculated sublethal doses of toxin finally died, but without any evidence of generalized tetanus.

In other experiments proof is offered that the development of muscular rigidity after injection of the cord will occur only when the cord is severely traumatized or transected above the level of injection. The authors contend that the erroneous interpretation of Meyer's experiments was due to the failure to recognize the importance of the element of cord trauma involved in the technique used.

JOHN LOCKWOOD, M D

Curtillet, E., Laffargue, P., and Fabiani, G.: Malignant Staphylococchia of the Face (Staphylococcie maligne de la face) *Ann d'anal path*, 1938, 15 297

Curtillet and his associates note that surgeons are familiar with malignant staphylococchia of the face, to which they have given the name of "anthrax", it has also been called "staphylococcus erysipelas," but neither of these terms correctly describes the lesion.

An illustrative case is reported which shows the characteristics of this lesion. The patient was a man forty years of age, he was admitted to the hospital seven days after the onset of symptoms. The entire left side of the face was involved, the lips were swollen to three times their normal size, of a dark purplish color with numerous yellow spots, the swelling of the rest of the face was of a redder color, with the same yellow spots, and of a hard consistency. The examiner's finger introduced into the mouth was covered with pus. There was high fever, and the patient was gravely ill, he died the next day in spite of the treatment that was instituted.

At autopsy, pathological examination showed that the lesion was characterized by diffuse infiltration of the facial tissues with "innumerable" small abscesses, filled with yellow pus, the subcutaneous tissue, the fatty cellular tissue, the masseter and cutaneous muscles, and the parotid gland were all involved. In the superficial layers of the skin, the hair follicles and sweat glands were not involved as a rule, if involved at all, it was evident the infection had extended upward from the deeper tissues. The skin and its appendages evidently played no rôle in the extension of the suppurative process. Around the small abscesses, areas of necrosis and degeneration extended into the fatty cellular tissues of the face and into the muscles. The staphylococcus could be found only in the center of the abscesses.



Fig 1 Lymphatic vessel, dilated and filled with pus. Artery intact

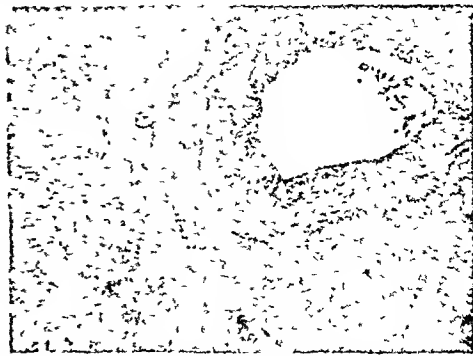


Fig 2 Facial vein. Absence of thrombosis. A purulent exudate present in the lumen of the vein. In the perivascular tissue, dilated lymphatics and a microscopic abscess.

The veins were but little involved, although there was some inflammation of the adventitia due to extension from the surrounding tissues. There was no thrombosis in either the large or the small veins, however, in some of the veins small masses of fibrin and leucocytes containing staphylococci were found. The lymphatic vessels were more definitely involved, there were intracellular staphylococci with globules of pus in the walls of the lymphatics that were otherwise intact, and in other areas the walls were more or less broken down and appeared as the center of the formation of a microscopic abscess. It is evident that the lymphatics play an important rôle in the spread of the infection.

ALICE M MEYERS

ANESTHESIA

Blomfield, J.: Present-Day Anesthetics. *Practitioner*, 1938, 140 225.

The disadvantages which arise from the use of the complicated apparatus in modern anesthesia are

1 Accidents, such as disasters due to the wrong fitting up of the machine, which occur much more

autopsy findings in rabbits killed by electricity were hyperemia of the meninges and moderate hyperemia and stasis at the pulmonary bases. The rest of the abdominal and thoracic viscera were normal. Gross examination of the central nervous system showed no lesions. Histological study of the viscera revealed no abnormalities.

Caselli of Pisa has treated people who were shocked by an alternating current of 3,800 volts and 16 cycles a minute. He has seen numerous cases in which the cardiac and respiratory functions had ceased for an hour. The author tends to favor Caselli's explanation of death by electricity, namely, that it is a state of shock which causes an arrest of cellular metabolism and stoppage of circulation and respiration.

JACOB E. KLEIN, M.D.

Christopher F. The Treatment of Wounds. *Tex Internal Clin.*, 1938, 2, 81.

The author believes that improper treatment of wounds is widespread and is often worse for the patient than his injury. Improper treatment is due partly to a false reliance upon antiseptics, a failure to recognize that *all antiseptics injure growing cells*, that injury resulting from the application of strong antiseptics favors bacterial growth, and that healthy unharmed cells have a powerful bactericidal action. Sound surgical principles must be observed in the care of every wound, clean or infected.

The author reviews briefly the process of the healing of wounds and notes the following factors which encourage it: a minimal number of bacteria, good hemostasis, an adequate blood supply, and rest. Motion produces congestion and disturbs the delicate process of wound repair. Conversely, the factors which discourage wound healing are the presence of dirt, foreign bodies, and devitalized tissue, poor hemostasis, undue motion, and measures which interfere with circulation, such as tight sutures or bandages.

The method of treating fresh wounds is described in detail. No antiseptic of any kind is used in the wound or on the surrounding skin. This point is stressed repeatedly. In properly treated cases the wound should be closed without drainage and if possible the injured part put at rest. Complete closure of the wound is the best protection against further invasion by additional bacteria.

The care of dog bites, human bites, and puncture wounds is considered.

In the treatment of infected wounds the important factors again are rest and the avoidance of trauma and of strong antiseptics. Dakin's solution is believed to be the best of the antiseptics that may be used. The author comments briefly on the use of cod liver oil, silver urea crystals, and sulfanilamide for infected wounds.

HARVEY S. ALLEN, M.D.

MacCollum D. W. The Early and Late Treatment of Burns in Children. *Am. J. Surg.*, 1934, 39, 275.

The author believes that the initial shock in burns is due to fright and pain and that the best treatment

consists of the administration of sedatives, warmth, and cardiac stimulants. At this stage blood transfusions are contra-indicated, but the intravenous administration of saline and glucose solutions is advocated. After the first twenty-four hour period there is an anhydremia from the loss of fluid in the burned area. Large amounts of fluids are injected intravenously and transfusions are given after a few days if there is edema or a lowered serum protein.

The burn is treated by cleansing under nitrous oxide ether anesthesia, complete third stage surgical anesthesia is insisted upon. The area is then scrubbed with sponges which have been soaked in green soap and hydrogen peroxide. This is followed by lavages of alcohol and hexylresorcinol. Chilling and exposure are to be avoided. Ointments are used on small burned areas, on burns of the first degree, and on burns about the body orifices. Tannic acid, and tannic acid and silver nitrate are used on the more severe burns. Pressure dressings are used to keep the granulations down. Skin grafts are applied frequently and judgment must be exercised in the consideration of the type of skin graft to be utilized in covering large areas. The 'island graft' is mentioned for covering large areas, although the Oiler-Thiersch or split Thiersch graft is usually more satisfactory. Pressure dressings are used over the grafted areas. Contractures are treated by massage, physiotherapy and occupational therapy for a period of six months. Various types of plastic repairs for contractures are described with illustrations and case reports. Keloid formation is treated early with the roentgen rays. In selected cases excisions are done.

STANLEY J. SZEGZA, M.D.

Flour W. M. and Jonas A. F. Jr. Researches on Tetanus. VI. The Production of Reflex Motor Tetanus by Intraspinal Injections of Tetanus Toxin. *Bull. Johns Hopkins Hosp.*, Balt., 1935, 63, 91.

The experiments of Meyer and his associates in 1903 and in 1916 involving the introduction of lethal quantities of tetanus toxin into the intact and transected spinal cords of experimental animals had been interpreted to indicate that the muscular rigidity and reflex spasms of tetanus were solely of central origin, because of the action of the toxin on motor cells in the cord. These experiments have been cited frequently in support of the nerve transmission theory of tetanus intoxication.

In a series of reports over a period of years Abel and his associates have been attempting to prove that the nerve transmission theory is fallacious, that tetanus toxin acts primarily on neuromuscular terminals and after transmission through the blood stream on central motor centers. This article is the sixth in this series. In it are reported experiments similar to those of Meyer but with refinements in technique which permit more precise interpretation of the results. Carefully measured amounts of toxin, from one-fourth to one one hundred and sixtieth of a lethal dose, were injected into the anterior horns

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Yater, W. M., and Whitmore, E. R.: Histopathological Study of Tissues of 65 Patients Injected with Thorium-Dioxide Sol for Hepatosplenography. With a Follow-Up Study of 10 Old Cases *Am J M Sc*, 1938, 195-198

Although the dangers of thorium-dioxide solution as a roentgenographic contrast medium as reported from various sources have caused most clinicians to regard its use with disfavor, the authors state that definite permanent harmful effects due to its use in man have not been demonstrated to their satisfaction. They admit that because of the slowness with which the effects of radio-active substances develop, more time must elapse before it may be said that amounts ordinarily used are harmless. Until such time, caution should be observed in its use, only small doses should be employed for arteriography, larger doses may be used for hepatosplenography in patients whose span of life is probably limited to a few years. In an experience involving several hundreds of patients over a period of six years they have not observed any permanent harmful effects and extremely few immediate alarming reactions.

They present detailed case histories of 10 patients from among a large number still alive years after the injection of thorotrast for the making of hepatosplenograms. These 10 patients have lived from nearly four to nearly six years after the injection of the contrast medium. Some of the patients had very serious diseases, such as leukemia and cirrhosis of the liver, but all were doing as well as or better than patients with similar diseases. In 2 patients subcutaneous nodules resulted from the accidental injection of thorotrast into the tissues of the arm, but there was no evidence of neoplastic reaction adjacent to the nodules. The liver and spleen still cast excellent shadows in all the patients, but there was also evidence in all of movement of the thorotrast from these organs, and deposition of the contrast medium in the adjacent lymph nodes.

Recognizing the potential danger of the diagnostic injection of thorium dioxide as reported by others, the authors endeavored to ascertain the actual danger as revealed by the examination of tissues of patients who had received such injections under their own observation. Of 64 cases coming to necropsy and studied histologically 8 were chosen as illustrative of the behavior of thorium dioxide and the reaction of the tissues after intervals of from a few days to three years following the injection, these cases, which represented various conditions, are described in detail. In no case was there any evidence of injury to the tissues or cellular reaction that could be ascribed to the presence of the thorium dioxide.

In addition to the above, one of the cases gave the authors an opportunity to study a subcutaneous

nodule resulting from leakage of some of the thorotrast about the site of the injection into the vein. This nodule was excised four years and five months after the injection. The thorium dioxide was walled off by dense hyaline connective tissue, the nodule resembling those found in the lungs in nodular silicosis. Nowhere was there any evidence of injury to the tissues or cellular reaction other than the primary reaction resulting in the walling-off of the thorium dioxide.

Several roentgenograms and numerous photomicrographs are included illustrating some of the findings.
ADOLPH HARTUNG, M.D.

Lenarduzzi, G.: The Roentgen Picture of Encapsulating Peritonitis (La peritonite incapsulante ai raggi X) *Radiol med*, 1938, 25-266

The roentgen picture of this condition was first described by Vespignani in 1932. Since that time the author has been able to diagnose 5 similar cases on the basis of the roentgen findings.

Clinically the condition is indistinguishable from other abdominal syndromes. The patient usually complains of postprandial abdominal inflation, moderate diffuse gas pains, and in severe cases the symptoms may suggest the presence of an acute intestinal involvement. On physical examination a smooth mass is usually felt in the abdomen which is of elastic consistency. The condition has been confused pre-operatively with stenosis of the small intestine, intussusception, appendicitis, tuberculous peritonitis, mesenteric cysts, uterine fibroids, twisted ovarian cysts, pancreatic cysts, fecaloma, abdominal neoplasms, and internal hernia of the small intestine.

Figure 1 shows the macroscopic aspect of the lesion. On opening the peritoneal cavity there usually appear several sausage-shaped masses adherent to one another. They enclose the entire small intestine. Figure 2 shows schematically the disposition of the intestinal loops within the "capsule," and Figure 3 shows the roentgen picture of one of the author's patients in whom the correct diagnosis of encapsulating peritonitis was made pre-operatively.

The radiological picture of this condition may be summarized as follows:

The small intestine shows a piling-up of almost all its loops which depends upon the extensiveness of the process. A sausage-like mass is thus produced which is well delimited from the normal residual portion of the small intestine and also from the stomach and colon.

The piling-up of the intestinal loops may leave their aspect unaltered, but if the capsule becomes adherent to the visceral peritoneum, the individual loops are approximated and the entire mass may suggest the presence of greatly dilated intestinal loops equal in caliber to those of the colon. In addition the mass may appear segmented and give

easily when the apparatus in use is complex than when it is simple. e.g. carbon dioxide is given by mistake instead of oxygen or liquid anesthetic is delivered into the air passages.

2 Accidents arising from faulty electrical connections or from static sparks generated near the machine.

3 Accidents due to the passage of the tube conveying the anesthetic into the alimentary instead of the respiratory tract.

4 The futility of the teacher in hospitals to instruct the student in the use of the complicated methods since the average practitioner will use the simpler apparatus in private practice.

The complication of anesthetic apparatus and methods has arisen mainly from two causes: the employment of gaseous anesthetics instead of those which are liquid in their natural state and the use of basal narcosis. The old anesthetics ether and chloroform are poisons. The need for a non-toxic anesthetic was but partially met with nitrous oxide as long as the operations were short. It was the in-

vention of an apparatus which enabled the gas to be given for long periods and under pressure that made nitrous oxide an efficient substitute for ether and chloroform. Premedication or basal narcosis was another way in which it was found possible to use nitrous oxide for severe operations. With the aid of strong sedatives and hypnotics (avertin, the barbiturates and paraldehyde) nitrous oxide, cyclopropane and ethylene are nearly always able to replace ether and chloroform.

The advantages of present-day methods are numerous.

1 The toxic anesthetics are little used; this diminishes operative risks and lessens postoperative complications.

2 Basal narcosis saves the patient from the danger associated with the psychic aspect of anesthesia.

3 Endotracheal methods obviate many of the troubles associated with the taking of an anesthetic and not only facilitate many operations but also render some possible which could not be performed without their aid.

SAMUEL KARY, M.D.

The following conclusions are reached.

1. Roentgen and radium irradiation as applied therapeutically has no significant effect on the red-cell count or the hemoglobin content of the blood

2. Anemia *per se* is not a contra-indication to radiation therapy

3. Therapeutic irradiation tends to lower the leucocyte count. This is by no means a universal effect

4. The various leucocytes are affected differently by irradiation. The greatest decrease occurs in the lymphocytes, and then the neutrophils, with the monocytes and eosinophiles being the least affected

5. In this study there was no apparent relationship between the effect on the leucocytes and the part of the body treated, the amount of irradiation, and the period of time during which the patient was irradiated. The effect appeared less marked, the smaller the size of the areas treated

6. On the average, about five weeks were required after irradiation for the count of the various leucocytes to return to the pre-irradiation level. When the count does not return to this level in a period of eight weeks it suggests an unfavorable prognosis

7. Daily intramuscular injections of 2 c cm of liver extract, 20 c cm of which represents the extraction from 100 gm of fresh liver, did not prevent the depressing effect of irradiation of the leucocyte count

8. No evidence was found to indicate that the effect of irradiation on the blood is to render the patient more susceptible to infection

9. Irradiation leucopenia does not prevent an increase in the number of leucocytes when infection occurs. There is reason to believe, however, that this increase is not as great as that which occurs in non-irradiated individuals

10. Clinical observation fails to reveal any detrimental effect on the general health of the patient, which might be directly attributable to irradiation leucopenia

11. Attempts to increase the leucocyte count in irradiated patients by intramuscular and intravenous injections of liver extract in amounts sufficient to cause a definite leucocytosis in normal persons were unsuccessful

12. The intravenous injection of typhoid vaccine, which normally causes a sharp rise in the leucocyte count, produced no significant effect in patients receiving, or immediately after receiving, a series of radiation treatments. Several months after the cessation of therapy a characteristic response was obtained

13. Injections of liver extract or typhoid vaccine afford a means of determining whether the blood of an irradiated patient has recovered sufficiently to permit a second series of treatments

14. It would seem inadvisable, as the result of irradiation, to permit the neutrophils to drop below 1,000 and the lymphocytes below 250 cells per c mm of blood

15. From a practical point of view, the effects of irradiation on normal blood, as determined by the blood count, are of little clinical significance

16. An accurate record should be kept of the blood of all patients receiving radiation therapy, not because of the effect of irradiation on the blood, but as an additional means of following the clinical course of the patient's disease

17. It is recommended that one or more complete blood counts be made before irradiation is begun and repeated during irradiation every two weeks, or oftener, if the leucocyte count tends toward a low level. If significant changes occur in the blood, counts should be continued until the blood has returned to its pre-irradiation state

ADOLPH HARTUNG, M D

Gershon-Cohen, J., Shay, H., Fels, S. S., Meranze, T., and Meranze, D.: The Thymus: The Effect of Atrophy of the Thymus Following Roentgen Irradiation. *Am. J. Roentgenol.*, 1938, 39: 263

Rats secured from the Wistar Institute were treated in this series of experiments. Roentgen therapy was administered to the thymus, beginning on the second day after birth. The exposures were made through the superior mediastinum, anteriorly in some, and into the superior mediastinum through lateral portals, in others. Daily treatments with an average dose of 550 roentgens were given, using 130 kv, 5 ma, 25 cm distance, 6 minutes exposure, 2 mm aluminum filter, and portals 8 by 10 mm in diameter. The total skin dose to any one portal varied from 275 to 5,000 roentgens, and the estimated dose to the center of the thymus ranged from 200 to 3,500 roentgens. The report is on the basis of studies on animals which received a total dose of 2,200 roentgens, or more, to the skin, or about 2,000 roentgens to the thymus. This amount of irradiation results in complete gross atrophy of the gland within from four to six days after the beginning of treatment, and produces complete thymic atrophy consistently.

When 2,200 roentgens were given through the anterior portal in 4 daily doses of 550 roentgens each, there was observed a retardation in the development of the gonads, which was most marked in the male. To date, the authors have seen the changes extend over a period of one hundred and fifty days, which is at least one hundred days beyond the advent of puberty in the rat. On microscopic examination of the testes, no spermatogenic cells in an active stage were apparent. Sterility could be predicated on this histological picture. The ovary, after thymic atrophy, showed a slight degree of retarded development. There was very little evidence of interference with oogenesis and the estrus remained normal. The uterus and vagina were slightly retarded in development.

The pituitary gland seemed slightly enlarged, more in the male than in the female, and particularly the anterior lobe. The basophiles were increased in number and enlarged, and showed irregularity in

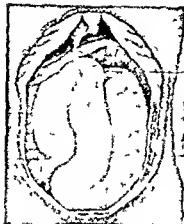


Fig 1



Fig 2



Fig 3

a pseudo-obolic effect (Vespignani's sign). The latter sign is characteristic in advanced cases. With the aid of pressure the mucosal valves may be visualized also and this is of great aid in establishing a differential diagnosis.

The signs of intestinal obstruction—dilatation and absent peristalsis—are usually absent and there is no marked retardation of radioopaque substance through the gastro-intestinal tract. If a large number of loops of the small intestine is involved the latter appears greatly shortened.

Concerning the other intestinal segments the stomach is usually pushed upward and toward the right and the inferior half of the greater curvature will be flattened out as the result of pressure exerted by the intestinal mass. The transverse colon appears deformed as a rule. It may appear lifted or depressed, this depending upon whether the intestinal mass is pushing it up or is retracting it. If the process involves multiple segments the various portions of the gastro-intestinal tract may be completely obliterated in the roentgen film.

RICHARD E. SOMMA, M.D.

Kornblum K, Boerner F and Henderson S G
The Effects of Irradiation on the Normal Blood Cells as Determined by the Blood Count. *Am J Roentgenol* 1938, 39, 235.

Although it was realized that most of the ground covered in this study had already been extensively investigated by others, clinical investigation seemed justified in view of the conflicting opinions as to the clinical significance of the findings observed and their value as a check upon radiation treatment.

In addition to the determination of the effects of therapeutic irradiation upon blood cells as revealed by their count and upon the hemoglobin content, answers to the following questions were sought as part of the study: (1) Are the various white cells affected in the same manner and to the same

extent? (2) Does the leucocyte count ever return to normal? (3) If so, how much time is required? (4) Can the leucocytic depression be prevented? (5) What effect does the leucopenia of irradiation have on the patient? (6) Are such patients more susceptible to infection? (7) What is their leucocytic response to infection? (8) Can the leucocyte count be increased artificially? (9) How long is it safe for the leucocyte count to drop in a patient receiving irradiation?

To obtain the information desired, 100 unselected patients referred for radiation therapy for both benign and malignant conditions were studied. They are tabulated as to age, sex, race, diagnosis, amount of treatment, duration of treatment, anti-anemic therapy, previous irradiation, detailed blood examination and clinical result. The character of the lesion was of less interest than the part of the body treated, since it was desired to find out whether the effect on the blood varied with the part of the body treated. For this reason the patients were divided into groups comprising pelvic, thoracic, abdominal, head-neck, extremities and multiple areas. The type of radiation included deep and superficial roentgen therapy and radium therapy. Complete data of various technical details are given.

The results obtained are described at length and some of the effects are tabulated. Several charts illustrating the effect of infection on the blood of irradiated patients, the effect of liver extract on irradiation leucopenia and the effect of typhoid vaccine on the leucocyte count of irradiated individuals are included. In the authors' final discussion of the various phases of their study, their findings are compared to those of other investigators along the same line of study and shown to be essentially in general agreement with them. Attention is also called to many complicating factors which may alter the blood picture and which should not be ascribed to the irradiation.

The following conclusions are reached:

1 Roentgen and radium irradiation as applied therapeutically has no significant effect on the red-cell count or the hemoglobin content of the blood

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6 On the average, about five weeks were required after irradiation for the count of the various leucocytes to return to the pre-irradiation level. When the count does not return to this level in a period of eight weeks it suggests an unfavorable prognosis

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14 It would seem inadvisable, as the result of irradiation, to permit the neutrophils to drop below 1,000 and the lymphocytes below 250 cells per c mm of blood

15 From a practical point of view, the effects of irradiation on normal blood, as determined by the blood count, are of little clinical significance

16 An accurate record should be kept of the blood of all patients receiving radiation therapy, not because of the effect of irradiation on the blood, but as an additional means of following the clinical course of the patient's disease

17 It is recommended that one or more complete blood counts be made before irradiation is begun and repeated during irradiation every two weeks, or oftener, if the leucocyte count tends toward a low level. If significant changes occur in the blood, counts should be continued until the blood has returned to its pre-irradiation state

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Gershon-Cohen, J., Shay, H., Fels, S. S., Meranze, T., and Meranze, D.: The Thymus: The Effect of Atrophy of the Thymus Following Roentgen Irradiation. *Am J Roentgenol*, 1938, 39 263

Rats secured from the Wistar Institute were treated in this series of experiments. Roentgen therapy was administered to the thymus, beginning on the second day after birth. The exposures were made through the superior mediastinum, anteriorly in some, and into the superior mediastinum through lateral portals, in others. Daily treatments with an average dose of 550 roentgens were given, using 130 kv, 5 ma, 25 cm distance, 6 minutes exposure, 2 mm aluminum filter, and portals 8 by 10 mm in diameter. The total skin dose to any one portal varied from 275 to 5,000 roentgens, and the estimated dose to the center of the thymus ranged from 200 to 3,500 roentgens. The report is on the basis of studies on animals which received a total dose of 2,200 roentgens, or more, to the skin, or about 2,000 roentgens to the thymus. This amount of irradiation results in complete gross atrophy of the gland within from four to six days after the beginning of treatment, and produces complete thymic atrophy consistently.

When 2,200 roentgens were given through the anterior portal in 4 daily doses of 550 roentgens each, there was observed a retardation in the development of the gonads, which was most marked in the male. To date, the authors have seen the changes extend over a period of one hundred and fifty days, which is at least one hundred days beyond the advent of puberty in the rat. On microscopic examination of the testes, no spermatogenic cells in an active stage were apparent. Sterility could be predicated on this histological picture. The ovary, after thymic atrophy, showed a slight degree of retarded development. There was very little evidence of interference with oogenesis and the estrus remained normal. The uterus and vagina were slightly retarded in development.

The pituitary gland seemed slightly enlarged, more in the male than in the female, and particularly the anterior lobe. The basophiles were increased in number and enlarged, and showed irregularity in



Fig. 1

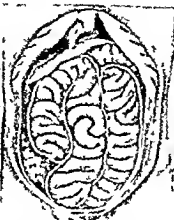


Fig. 2



Fig. 3

a pseudocob effect (Vespignani's sign). The latter sign is characteristic in advanced cases. With the aid of pressure the mucosal valves may be visualized also and this is of great aid in establishing a differential diagnosis.

The signs of intestinal obstruction, dilatation and absent peristalsis are usually absent and there is no marked retardation of radio-opaque substance through the gastrointestinal tract. If a large number of loops of the small intestine is involved the latter appears greatly shortened.

Concerning the other intestinal segments the stomach is usually pushed upward and toward the right and the inferior half of the greater curvature will be flattened out as the result of pressure exerted by the intestinal mass. The transverse colon appears deformed as a rule. It may appear lifted or depressed, this depending upon whether the intestinal mass is pushing it up or retracting it. If the process involves multiple segments the various portions of the gastrointestinal tract may be completely obliterated in the roentgen film.

RICHARD C. SOMMA, M.D.

Kornblum K. Boerner F. and Henderson S. G.
The Effects of Irradiation on the Normal Blood Cells as Determined by the Blood Count. *Am. J. Roentgenol.* 1938 30 232.

Although it was realized that most of the ground covered in this study had already been extensively investigated by others, clinical investigation seemed justified in view of the conflicting opinions as to the clinical significance of the findings observed and their value as a check upon radiation treatment.

In addition to the determination of the effects of therapeutic irradiation upon blood cells as revealed by their count and upon the hemoglobin content, answers to the following questions were sought as part of the study: (1) Are the various white cells affected in the same manner and to the same

extent? (2) Does the leucocyte count ever return to normal? (3) If so, how much time is required? (4) Can the leucocytic depression be prevented? (5) What effect does the leucopenia of irradiation have on the patient? (6) Are such patients more susceptible to infection? (7) What is their leucocytic response to infection? (8) Can the leucocyte count be increased artificially? (9) How long is it safe for the leucocyte count to drop in a patient receiving irradiation?

To obtain the information desired, 100 unselected patients referred for radiation therapy for both benign and malignant conditions were studied. They are tabulated as to age, sex, rare diagnosis, amount of treatment, duration of treatment, anti-anemic therapy, previous irradiation, detailed blood examination and clinical result. The character of the lesion was of less interest than the part of the body treated, since it was desired to find out whether the effect on the blood varied with the part of the body treated. For this reason the patients were divided into groups comprising pelvic, thoracic, abdominal, head, neck, extremities and multiple areas. The type of radiation included deep and superficial roentgen therapy and radium therapy. Complete data of various technical details are given.

The results obtained are described at length and some of the effects are tabulated. Several charts illustrating the effect of infection on the blood of irradiated patients, the effect of liver extract on irradiation leucopenia and the effect of typhoid vaccine on the leucocyte count of irradiated individuals are included. In the authors' final discussion of the various phases of their study, their findings are compared to those of other investigators along the same line of study and shown to be essentially in general agreement with them. Attention is also called to many complicating factors which may alter the blood picture and which should not be ascribed to the irradiation.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Bazzocchi, G : Vitamin C; The Bactericidal Properties of the Blood and Infection (Vitamina C, potere battericida del sangue ed infezione) *Ann Ital di chir*, 1937, 16 807

Recent clinical and experimental reports concerning the influence of Vitamin C in infections stimulated the experimental work reported by the author. Vitamin C, ascorbic acid, is widely distributed in nature in many vegetables and is present in abundant quantities in animal organs. The highest percentage content is found in the adrenal glands. The vitamin is excreted to some extent in the urine, and this elimination varies naturally with the condition of the urinary tract.

A résumé of recent literature is given. According to this résumé the action of Vitamin C is very complex and not well understood.

The author reports a series of experimental studies on the influence of Vitamin C upon the defense process of the organism during infection. The infection in the animals was established by the intraperitoneal implantation of colon bacillus cultures. The animals were maintained on diets containing varying amounts of Vitamin C. In these animals the bactericidal effect of the heart blood on known cultures of the bacteria was then used as a gauge.

The blood of normal control animals maintained on average diets was somewhat bactericidal, more potent in some than in others. The degrees are designated as maximal, elevated, and weak. Animals maintained on the average normal diet, and which were given an intraperitoneal infection with bacillus coli showed a decrease in the bactericidal properties of the blood.

Normal animals placed on diets devoid of Vitamin C revealed a marked decrease in the bactericidal properties of the blood. After being subjected to an intraperitoneal infection, however, the bactericidal properties of the blood in these animals increased markedly.

Animals placed on a very high Vitamin-C diet revealed an increase in the bactericidal property of the blood over and above that of the group of animals kept on the average laboratory diet. When these animals are inoculated intraperitoneally their blood is shown to have a markedly elevated bactericidal power. This is exactly the opposite reaction to that noted in the normal animals.

A. LOUIS ROSI, M.D.

Ward, G. E., and Jonas, A. F., Jr. Metastasizing Hemangioma Simulating an Aneurysm. *Arch Surg*, 1938, 36 330

The authors report a case of a histologically benign hemangioma of the ulnar artery, which following ex-

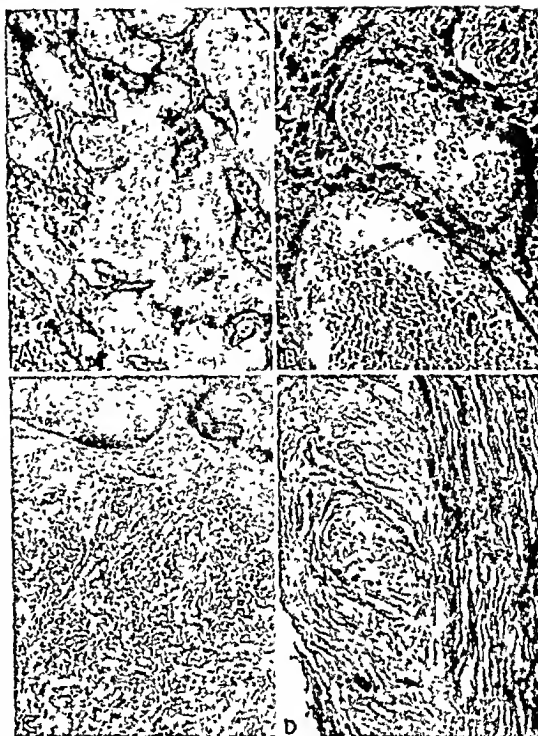


Fig 1 A, section of the original tumor showing the structure of a typical cavernous hemangioma. B, section from the recurrent tumor in the hand, showing the structure of a typical hemangioma. C, section of the recurrent tumor. Hyperplastic epithelium is shown in the upper part of the illustration, with the tumor directly beneath the skin. D, section from the epitrochlear node. There is complete replacement by the tumor, which here forms no vascular spaces. The cords of the tumor cells are lying at right angles to each other. Hematoxylin and eosin were used for staining.

cision and intensive irradiation, recurred and metastasized to the regional lymph nodes. The tumor exhibited invasive and destructive features.

The patient, an eighty-two-year-old man, had had a painless lump in the hypothenar region of the right hand for fifteen years, which increased in size and became painful three months previous to admission. The findings were compatible with that of an aneurysm of the ulnar artery in the palm. At operation the ulnar artery was ligated above the tumor. The dissection disclosed the ulnar artery entering the tumor proximally and continuing in the superficial palmar arch and leaving it distally. The tumor was well circumscribed and easily removed. The wound

staining affinity. So called castrate cells made their appearance and seemed to increase in number with the age of the animal up to one hundred days after birth in those so far studied. Eosinophiles seemed slightly decreased in number but otherwise normal. These changes were more pronounced and are all somewhat different in the male. In the female the basophiles were only slightly increased and not so large. No castrate cells were visible.

From ratios of the organ weight to the body weight there appeared to be a consistent relative hypertrophy in the male adrenals in the treated animal. This change was not consistent in the female.

A general effect on body development and weight was noted. Retarded growth was almost uniformly observed in the treated animal. This was first evident about three weeks after treatment. Studies of the ratio of the organ weight to the body weight revealed that the testes were markedly diminished while the pituitary gland and adrenals were increased slightly in the treated animal. These changes seemed to be confined to the male. The retarded and abnormal developmental changes in the gonads, pituitary and adrenals after thymic atrophy were therefore not merely an expression of the retardation in general body growth and development.

Mating experiments showed that when control males were mated with treated female, litters were cast. When treated males were mated with control females no litters were cast. This confirms the presence of sterility in the treated male.

The authors conclude that the thymus seems to govern or regulate the establishment of male genital growth and function. Since this reaches its climax at or after puberty the involution and atrophy of the thymus at this period seem natural.

A word of caution is given in regard to the treatment of enlarged thymic glands in infants although

the small doses currently in use are probably insufficient to produce any permanent change.

HAROLD C. OCHSNER, M.D.

Marlin C. L. and Moursund, W. H. Jr. Irradiation Sickness. *Radiology* 1938 30: 277

The authors discuss the types of reaction to irradiation and the methods which have commonly been used in their treatment. They were discouraged by the relative ineffectiveness of the various commonly accepted methods of treatment of these reactions.

Investigation of the effect of Vitamin B₁ in irradiation sickness convinced them that it is of greater value than other measures which have previously been used. At first small doses were used but the authors soon found that larger doses were more effective. The drug is given by mouth and intramuscular injection is resorted to only when vomiting occurs. This form of medication not only reduces or completely abolishes all nausea but it enables the patients to enjoy most of their meals and to maintain their nutrition, even while receiving long series of treatments over the abdomen. The investigations of the authors convinced them that several days were required for the body to become saturated with Vitamin B₁. For this reason 2,000 I.U. are now given daily for at least two days before the x-ray treatment is started and this dose is continued during the course of the treatment. If vomiting occurs 2,000 I.U. of Vitamin B₁ are given intramuscularly at once. In addition to the vitamin treatment a high carbohydrate diet is prescribed. If relief of irradiation sickness does not follow the use of Vitamin B₁, one of the soluble barbituric acid derivatives is given by rectum. The authors have not found it necessary to give glucose intravenously to any of the patients treated with Vitamin B₁.

HAROLD C. OCHSNER, M.D.

Parodi, L., and La Ragione, A.: The Behavior of the Polypeptides in the Blood Serum in Certain Infectious Inflammatory States (Il comportamento dei polipeptidi del siero di sangue negli stati infiammatori infettivi) *Arch ital di chir*, 1937, 47 645

The residual nitrogen and its fractions, such as urea, ammonia, creatinine, uric acid, and the polypeptides, have been under investigation for several years. The presence of larger or smaller quantities of these metabolites has been noticed in various pathological conditions and they have been believed to be responsible for various symptomatic manifestations.

After having reviewed briefly the literature on this subject, Parodi and La Ragione presented a study of the problem in 40 patients suffering from various conditions, such as suppurative mastitis, gluteal abscess, osseous inflammatory lesions, perirenal abscess, purulent pleurisy, subdiaphragmatic abscess, appendicitis with peritonitis, and various other inflammatory conditions.

Daily blood chemistry tests were taken and a quantitative estimation of the polypeptides was made according to the colorimetric method of Goiffon and Spahey.

In the majority of the cases the authors were not able to find an elevation of the polypeptide level in the blood serum. In fact, with only a few exceptions, the authors found that during the acute phases of the diseases the polypeptide level was lower than that which some authors consider to be its upper physiological limit.

The observed values, furthermore, were rarely, if at all, in direct proportion to the severity of the condition.

Parodi and La Ragione also studied the relationship of the blood-polypeptide fluctuations to the course of the disease, considering such factors as the general evolution of the disease, the general condition of the patient, and certain clinical data, such as the temperature, pulse, and respiration.

They found that in general the fluctuations of the blood-polypeptide level are directly related to the evolution of the pathological process, but this finding was by no means a constant one, as was shown by the fact that in a small percentage of the cases the polypeptide level did not present any parallelism whatsoever to the underlying condition and in other cases the results obtained were even diametrically opposed to those expected.

In view of the extensive cellular destruction which usually accompanies gangrenous processes, the authors completed this study by measuring the polypeptide level in 3 individuals presenting a non-septic gangrene. The first case represented a senile gangrene and the 2 other cases a dry gangrene of the upper and lower extremities, respectively, secondary to peripheral vascular disease.

The authors found that the polypeptide level in the blood serum was not markedly increased in these conditions, but the fluctuations followed closely the

evolution of the process. This could be clearly seen from the fact that the level of the polypeptides decreased steadily following surgical intervention in the first 2 cases. In the third case, however, no elevation of the polypeptide level in the blood was observed although the patient's condition grew gradually worse. On the contrary, shortly before the patient's death, the polypeptide level was slightly depressed as compared with previous values.

RICHARD E. SOMMA, M D

Hall, N., and Bagby, J. W.: Carcinoma in the First Three Decades of Life. *J Am M Ass*, 1938, 110 703.

One hundred and thirty-four cases of carcinoma occurring in persons thirty years of age or younger were confirmed by microscopic examination. The youngest patient in the authors' series was eight and one-half years old, and had xeroderma pigmentosum with carcinomatous changes. The youngest patient with carcinoma of the lip was nineteen years of age, of the breast twenty-two years (2 patients), of the ovary fifteen years, of the cervix twenty years, and the youngest patient with multiple basal-cell carcinoma was twenty-two years. For the past five years, in the authors' material, 17 per cent of the cases of cancer diagnosed microscopically, excluding those of the female genital tract and breast, occurred in persons thirty years of age or younger. For the same period of time 74 per cent of the patients with proved carcinoma of the cervix were in the first three decades of life. Four and three-tenths per cent of the cases of mammary cancer occurred in the same age period. Carcinoma of the cervix and breast in persons thirty years of age or younger has increased in a greater ratio at the clinic at the Barnard Free Skin and Cancer Hospital for the past five years as compared to the previous five years than the same condition in older women.

Carcinoma of the cervix, of the mouth, and, to a lesser degree, of the breast is more malignant and has a poorer prognosis in young persons than the same condition in older patients. The grading of the microscopic sections, the symptoms, and the duration are about the same in persons thirty years of age or younger as in older persons. Sarcoma is generally considered to be more frequent in young persons than in older ones. However, at the aforementioned clinic, the actual number of cases of carcinoma in the first three decades of life was greater than that of sarcoma.

JOSEPH K. NARAT, M D

Buddington, W. T., and Taylor, G. W.: The Loss of Blood in Certain Standard Operations for Malignant Disease. *New England J M*, 1938, 218 285.

The determination of the amount of blood lost in operations is of great interest and value. The amount becomes of major importance in a patient with malignant disease who is a poor risk. A knowledge of the amount lost in certain types of operative pro-

healed nicely and the patient was discharged three days later. Eight weeks later the patient returned because of pain and swelling at the operative region. At this time a fluctuant swelling was noted beneath the skin of the palm. The wrist was purple and a long red streak extended up the flexor surface of the forearm. Intensive radiation of the right hand and axilla was started. Three months later the tumor was noted to be three times its original size and a large mass of glands were palpable in the axilla. The patient died two weeks later.

An autopsy revealed a hard tumor mass 6 by 4 cm attached to the palmar surface of the right hand on its ulnar margin. The tumor was adherent to the underlying structure and had eroded the fifth metacarpal bone. On section it was seen to contain many spaces filled with blood. No definite capsule was found. There was a fibrous band about 1 mm in diameter extending up the flexor surface of the forearm to the epitrochlear glands and continuing to the axillary glands. Section of the epitrochlear and axillary glands showed that they resembled the tumor below.

The microscopic examination of the original tumor showed the structure of a typical cavernous hemangioma. The section of the recurrent tumor of the hand showed the structure of a typical hemangioma. In places the angiomatous structures showed active invasion of the surrounding tissues. The lining cells of the blood spaces were dense, deeply staining, and almost round but showed no mitotic figures. The axillary nodes were almost completely replaced by tumor cells and there was a distinct tendency toward the formation of vascular channels.

HARVEY S. ALLEN, M.D.

Maggi N. and Parodi L. The Pathogenesis of Spontaneous Juvenile Gangrene Reaction of the Blood Vessels in Male Animals with Artificial Hyperadrenalemia after Castration and Ovarian Transplantation. (Contributo alla conoscenza della patogenesi della gangrena spontanea giovanile. Sul comportamento dei vasi sanguigni in animali maschi iper surrenalizzati e contemporaneamente castrati e femminecastrati). *Arch. sci. di chir.* 1937 47 481.

The authors review the literature on this complex subject and note that Oppel suspected juvenile gangrene to be due to endocrine disturbance with hyperfunction of the adrenal glands. The excess of adrenaline in the blood induced a disturbance in the blood vessels of medium and small caliber. Buerger presented the opposing view that the condition was due to an infection of unknown nature which induced a precipitation of masses of obliterating thrombi or obliterating thrombo-angitis. Oppel and his students have attempted to establish their theory by demonstrating adrenalinic vasoconstrictor substance in the blood of patients suffering from what they call "suprarenal arterial gangrene." The researches of Achutin Krawkow and Neprachin tend to demonstrate a hyperadrenalemia in these patients. In general researches have been favorable to

Oppel's hypothesis. There have been conflicting views as to the pathogenesis. One group holds that the initial site of the lesion consists of an alteration in the vessel wall, such as thickening of the media, formation of folds in the endothelium, and the subsequent proliferation of the latter. Another group of investigators is of the opinion that the condition begins with occlusion of the lumen by obliterating thrombi.

In 1933 Maggi transplanted the adrenal glands of rabbits subcutaneously into rabbits and found a thickening of medium caliber, folding of the intima and placcation and proliferation of the endothelium. In the veins he was able to note proliferation of the intima and the deposition of thrombi. These findings were confirmed in 1934 by Froehlich and Lucinisco, students of Leriche. They found that in the presence of hyperadrenalemia there was a proliferation of the intima with a resulting occlusion of the lumen and deposition of thrombi.

In view of the clinical experience that spontaneous juvenile gangrene occurred mostly in males, the authors set out in 1935 to determine the effect of sex on the pathogenesis of this condition. It was found that the vascular changes were quite pronounced in males, but could not be induced in females.

In the present series of experiments the authors have studied the effect of a series of adrenal transplants in the vascular structures of normal male rabbits and on castrated male rabbits with ovarian transplants. The findings are described in detail and illustrated with numerous photomicrographs. The authors found that changes in the arteries involved all three tunics; they began in the media extended to the intima and involved the adventitia to a minor extent. The veins exhibited a hypertrophy of the wall with a diminution in the elastic tissue and proliferation of the intima and occlusion of the lumen in some instances.

The authors conclude that it is possible to induce distinct vascular changes as the result of homoplastic transplants of adrenal tissue. As a result of these changes there is a successive deposition of thrombi and obliteration of the lumen. They confirm the view of those who state that these obliterative changes result from the lesions in the wall of the vessel. Castration had no effect whatever on the vascular changes caused by adrenal transplants. Those castrated animals which had received ovarian transplant were resistant to hyperadrenalemia and showed practically normal blood vessels. This confirms the experiences of Sicard who obtained favorable results in juvenile gangrene in boys by injecting female blood or ovarian extract.

The authors conclude that suppression of testicular hormones by castration does not interfere with the vascular changes induced by hyperadrenalemia. Furthermore, transplants of the ovary in previously castrated males nullify the vascular injuries caused by repeated homoplastic transplants of the adrenal gland.

JACOB F. KILBY, M.D.

The action of radium applied directly could be distinctly observed as early as from twelve to twenty-four hours after the beginning of the treatment and the effects increased in intensity up to the second day after the treatment. After the fourth and fifth day of treatment the effects gradually decreased in intensity and they disappeared completely two or more days after discontinuance of the treatment.

Operative interventions did not produce any noteworthy modifications, either in the urinary pH or in the elimination of free acid radicals, but they caused an increased elimination of acid radicals combined with ammonia.

In patients treated postoperatively with roentgenotherapy, the urinary pH did not undergo any changes even during or after roentgenological treatment. The titration acidity and the combined acidity, on the other hand, decreased progressively during and after the treatment.

Silvestroni observed also marked fluctuations of Hasselbach's ammonia coefficient and of the ratio between the total acidity and the total nitrogen. In general, these fluctuations were found to be in direct relation to the type of treatment instituted.

The ratio of the pH to the ammonia coefficient was found to be diametrically inverted with a shift toward the alkaline side in irradiated as well as surgically treated cases.

The author concluded by stating that the results obtained did not furnish sufficient evidence for the prevailing assumption that radium as well as roentgen irradiation produces a metabolic shift of the organism toward the acid side. On the contrary, it appeared from these results that radium therapy, roentgenotherapy, and even surgical treatment tended to shift the acid-base equilibrium slightly toward the alkaline side, and thereby correct certain abnormal metabolic states either by favoring the elimination of pre-existing acid metabolic products or by destroying the neoplastic masses which are probably the chief sources of these products.

RICHARD E. SOMMA, M.D.

Simpson, T., and Barker, M. H. The Subcutaneous Administration of Oxygen. *Arch Int Med*, 1938, 61, 198.

Large amounts of oxygen were injected subcutaneously in a dog before it was placed in a miniature oxygen chamber, and the oxygen content of the inspired air was reduced to 4 per cent in the course of five hours. No evidence of oxygen absorption was obtained.

With a dog in the chamber, the oxygen concentration of the inspired air was gradually reduced to 6 per cent during two and a half days. After the subcutaneous injection of 1,500 c. cm. of oxygen, the concentration of the inspired air was further reduced to 3 per cent within two and a half hours. The arterial blood and symptoms were unchanged.

Similar negative results were obtained in another dog, the oxygen content of the arterial blood did not alter and the percentage of desaturation was not

materially affected. The animal was removed from the chamber practically moribund. Two or three breaths caused a disappearance of the intense cyanosis. The animal subsequently recovered.

These experiments indicate that oxygen given intravenously to anoxic dogs, in much greater amount than is advised for adult human beings, fails to change the oxygen content or percentage of desaturation of the blood even in the presence of urgent need for oxygen. The great efficiency of oxygen inhalation is strikingly contrasted.

WALTER H. NADLER, M.D.

Gershenfeld, L.: The Sterility of Alcohol. *Am J M Sc*, 1938, 195, 358.

Minervini, in 1898, and later other workers demonstrated that non-spore-forming organisms could be killed by alcohol. Minervini using the thread method noted that while alcohol of 70 per cent strength killed the *Escherichia (Bacillus) coli* and the *Staphylococcus aureus* in sixty minutes, dehydrate or absolute alcohol required at least twelve hours for the former and more than three days for the latter organisms before destruction was complete. Olitsky *et al.*, in 1928, reported that the addition of alcohol to body fluids results in the production of dense coagula which protect micro-organisms and prevent penetration by the alcohol.

The inefficiency of alcohol as a germicidal agent for spore-forming bacteria has been demonstrated repeatedly. Koch, in 1881, showed that neither dilute nor strong alcohol would kill anthrax spores in one hundred and ten days. This was confirmed by Minervini and Russ. Stokes stated that the *Bacillus megatherium* remained viable for two weeks in alcohol. Heim was able to cultivate anthrax bacilli from infected threads which had been immersed in alcohol for twenty years. Dozier found that alcohol possessed no bactericidal effect upon the spores of *Clostridium botulinum*. Nye and Mallory reported the inefficiency of alcohol upon the spores of *Clostridium welchii* in a routine procedure of disinfecting surgical instruments, such technique having resulted in a serious outbreak of infections following operations. Schmidt reported that the sterile catgut threads become infected by alcohol when using terminal sterilization. Coulthard and Sykes reported that vegetative forms of bacteria are destroyed in a few minutes by concentrations over 60 per cent, but ethyl alcohol was impotent against bacterial spores.

In practice today, no reliance is placed upon the use of alcohol (dilute or strong concentrations) as a bactericidal agent for spore-forming organisms. Parenteral therapy with alcohol has been advocated as an aid in the relief of pain and discomfort in a variety of abnormalities. Subarachnoid injections of absolute alcohol for the relief of peripheral pain in the lower part of the back, the pelvis, and the legs have been made by Dogliotti, and many other workers have employed parenteral alcohol therapy with apparent success. Pozzi and Belleli have used intra-

cedures not only helps the surgeon to plan the pre operative and postoperative treatment but also guides him in the choice of a technique.

The method employed by the authors to determine the loss of blood is based on that of Gatch and Little although the latter is modified according to the recommendations of Stewart. Just before operation from 4 to 6 c cm of blood are withdrawn from a vein and mixed with a few milligrams of heparin. This prevents clotting without appreciably diluting the blood. Exactly 1 c cm of blood is mixed with known amounts of $N/10$ hydrochloric acid to form acid hematin. This constitutes the standard generally in a 1:500 dilution. With rare exceptions the skin is prepared with 3.5 per cent tincture of iodine. After drying this is removed with alcohol to prevent its absorption by the sponges and drapes that are used during the operation and thereby avoid errors in the calculation of the loss of blood. The sponges upon being discarded are dropped into pans of distilled water so that the blood will not dry and cake. All drapes, gowns and instruments stained with blood are washed in distilled water until the hemoglobin has been extracted. The sponges and linen are wrung dry by being passed through a wringer. Tissues removed from the body are washed free of gross blood. The total volume of the solution of laked blood thus obtained is accurately measured and a measured sample is converted into acid hematin by the addition of hydrochloric acid. This is compared with the standard in a colorimeter. The amount of blood lost is easily calculated from these data.

The loss of blood attendant upon certain standard operations for malignant disease was determined, and the results recorded. Factors tending to increase or decrease the blood loss are briefly discussed. The knowledge of the amount of blood lost in certain types of operations aids the surgeon in planning his operative, pre operative and postoperative treatment.

From the data collected the authors conclude that the desirability of postoperative transfusion in the average gastric resection rests on other grounds than the amount of blood lost at operation.

The results in resection of the rectum are significant. In this procedure the authors separated the blood lost in the abdominal excision from that lost in the perineal excision. The latter procedure was carried out with the patient either in a lateral position or in that employed for lithotomy. It was at once apparent that most of the blood loss came from the perineal excision even when due allowance was made for blood which had collected in the pelvis during the interval between the two parts of the operation and was thus included in the loss at the time of the second operation. The shock which occasionally developed during the latter part of the operation can be attributed in great degree to this sudden loss of a large amount of blood. The total loss is striking and strongly supports the policy of giving at least one transfusion and not infrequently

two in such combined procedures. The authors' routine practice is to start a continuous intravenous saline clysis at the beginning of the operation, the citrated blood for transfusion being added when the posterior excision is begun.

During the study a record was kept of several factors which it was believed affected the amount of blood lost, for example, the patient's blood pressure and pulse and the speed and skill of the operator. Correlation of these factors resulted in certain general deductions. A high blood pressure during the operation of course increased the rate of blood flow from the ends of severed vessels. Obesity contributed to a higher blood loss in two ways: (1) the additional amount of tissue to be dissected necessitated cutting a great many additional vessels and (2) accurate and secure application of hemostatic clamps was more difficult because of the friability of the vessel in the adipose tissue. When all the factors tending to decrease the blood loss operate together the loss may be unusually small, for example, 134 c cm for a radical mastectomy.

While the amount of blood lost has a distinct bearing on the development of postoperative shock, other influences are also powerful. The character of the anesthesia, the manipulations, the time consumed by the operation, cooling, the rapidity of blood loss, and the general condition of the patient are important factors. JOSEPH K. NARAY, M.D.

Silvestroni E. The Influence of X Ray and Radium Irradiation upon the Acid Base Equilibrium of Patients with Cancer (*L'influenza della radiazione e della curioterapia sull'equilibrio acido basico dei cancerosi*). Tumori 1938 24: 1.

Silvestroni studied the action of x ray and radium irradiation upon the acid base equilibrium in 32 patients with carcinoma 12 of whom were treated with actinotherapy and 10 surgically.

The author observed that in almost all of the cases treated with actinotherapy there occurred during the treatment a slight decrease of the urinary pH which returned to its normal value soon after the discontinuance of the treatment.

Silvestroni noticed furthermore an increased elimination of free acid radicals during radium treatment and pleurocentenotherapy whereas the elimination of free acid radical was decreased during roentgenotherapy. In patients treated with radium the titration acidity decreased after the treatment to a value lower than that observed before treatment was instituted whereas in patients treated with roentgenotherapy or pleurocentenotherapy the titration acidity was increased to a value above that observed before treatment.

The elimination of acid radicals combined with ammonia did not undergo any noteworthy modifications in patients treated roentgenologically but it decreased from 8.82 to 6.87 in patients treated with radium or pleurocentenotherapy and it increased from 7.51 to 9.01 in cases treated with roentgenotherapy.

of the various reports on the toxic effects of sulfanilamide indicates that severe symptoms are of less frequent occurrence than has recently been feared. The fatalities recently reported in the United States have been found to be due to the presence of diethylene glycol in the preparation employed.

In other cases it is possible that the symptoms arising are not due entirely to the sulfanilamide. Many of the patients treated are in a serious condition, have suffered from a severe infection for weeks, and have been treated with other drugs, which may also have toxic effects. In some cases sulfanilamide has been combined with other methods of treatment which tend to intensify its toxic effects, such as treatment with saline purgatives, or ferrum or sodium sulfate, the latter tending to intensify the production of sulfhemoglobinemia. There has also been a marked variation in the dosage of sulfanilamide employed, and in some cases the medication has been continued after the appearance of toxic symptoms.

Administration by mouth appears to be preferable as the drug is well absorbed by this route, subcutaneous injection does not result in a greater concentration of the drug in the blood. If administration by mouth is impossible, sulfanilamide may be given by subcutaneous or intramuscular injection, or in the case of meningitis, intraspinally.

In the treatment of severe infections, initial doses of from 5 to 6 gm in twenty-four hours are indicated, this dosage is best divided into 4 equal doses given every six hours and is continued until the concentration of the drug in the blood reaches from 8 to 10 mgm per c cm. When improvement is noted the dose can be reduced to 4 or 3.5 gm, a dosage which can be continued for three or four weeks if necessary. If no improvement results, subcutaneous injection may be tried, the dosage should not exceed 5 gm daily. Sodium bicarbonate may be given with sulfanilamide, but the sulfates are incompatible.

In patients receiving treatment with sulfanilamide in large doses, frequent examinations of the blood should be made to determine any changes that would indicate danger of either anemia or leucopenia.

If slight or only moderately severe toxic symptoms develop, it is usually sufficient to reduce the dosage. However, if severe symptoms develop, the medication must be stopped, large amounts of fluid should be given to hasten elimination, and blood transfusions should be made, especially in cases showing evidence of agranulocytosis or anemia. The addition of 0.65 gm of sodium bicarbonate to each dose of sulfanilamide usually prevents acidosis. In cases of sulfhemoglobinemia, injections of saline or glucose solution are usually effective, if symptoms are more severe blood transfusions are indicated. Oxygen therapy is not effective in sulfhemoglobinemia, but it is valuable in methemoglobinemia.

In the treatment of gonorrhea, it has recently been found that relatively small doses of sulfanilamide if combined with local treatment, hyperpyrexia, or vaccine therapy are a valuable adjuvant. Other

modifications in the therapeutic use of the drug may be devised which will increase its usefulness.

ALICE M. MEYERS

Standard, S., Brandaleone, H., and Rall, E.P.: Surgical Results in the Treated and Untreated Diabetic Patient. *J Am M Ass*, 1938, 110 627

The prognosis after surgery is evaluated in 474 cases of diabetes, and the mortality in 302 non-clinic patients under poor diabetic control is contrasted with that of 172 well managed patients who had received previous care in special clinics. The mortality rate of the entire series was 15.8 per cent, but in the well managed diabetics it was only 6.9 per cent as compared with 20.8 per cent in the poorly controlled group. The mortality was lower among the patients who had had the advantage of previous clinical care in all of the surgical complications, and particularly among those requiring major amputations (16 per cent as compared with 49 per cent). The necessity for proper control of the diabetes at all times, lest the prognosis be jeopardized in the event of any complication, is stressed.

High carbohydrate and restricted fat diets were used on the surgical services.—Ch 180 to 250 gm, P 70 to 80, and F 75 to 85 gm, if possible—for several days before operation. The average patient was given an infusion of 1,000 c cm of physiological salt solution with 50 gm of dextrose two hours before operation, and again after operation. For minor procedures, 300 c cm of orange juice were given by mouth an hour and one-half before operation. Insulin is adjusted postoperatively on the basis of the urine tests. When food is tolerated by mouth, feedings containing from 25 to 50 gm of carbohydrate were given at intervals of four hours. The original dietary formula, in semi-solid form, divided into four or five feedings, was allowed after from four to six days, and within ten days the original diet was resumed. Insulin was given before feedings in amounts adequate to keep the urine sugar free.

In elective surgery, the technique is the same as that used in non-diabetic patients. In infections of the lower extremities a tourniquet is not used, and local infiltration and strong antiseptics are avoided. The major problems of judgment as to the surgical procedure to be followed are influenced by the many individual factors.

WALTER H. NADLER, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Keefer, C. S., Ingelfinger, F. J., and Spink, W. W.: The Significance of Hemolytic Streptococcal Bacteremia. A Study of 246 Patients. *Arch Int Med*, 1937, 60 1084

A clinical study of 246 patients with hemolytic streptococcal bacteremia is presented, together with laboratory observations on the virulence of the infecting organisms and the immunity of the patients. The general mortality rate was 72 per cent, with the highest rate in patients with cellulitis and ery-

venous injections of alcohol (10 c.c. of 33 per cent alcohol in a 45 per cent solution of dextrose) and have noted an increase in the bactericidal power of the blood

Commercial alcohol has been generally accepted as being bacteria free. Only those workers who concern themselves with problems of disinfection and sterilization are familiar with the actual bactericidal properties of alcohol and have knowledge of the bacterial content of commercial alcohol

A survey of the literature and personal conversation with many workers who employ injections of alcohol revealed that at least in this country the alcohol used in such injections is rarely redistilled, Berkefeld filtered or otherwise treated as in sterilization techniques

One hundred and twenty five samples of commercial ethyl alcohol consisting of 100 samples of 95 per cent alcohol and 25 samples of absolute alcohol were obtained on the open market from as many different sources as possible. All of these samples of ethyl alcohol produced in this country were found to be free of bacteria and their spores. This is in contrast to reports from Europe where the commercial product frequently was found to be contaminated with spore formers. Alcohol (95 per cent) did not kill *Bacillus megatherium* and *Bacillus subtilis* until after approximately three months exposure for the first organism and after seven and nine months respectively, for two strains of the latter organism. ELLA M. SALMONSEN

Marshall E. K. Jr., Cutting W. C. and Emerson K. Jr. The Toxicity of Sulfanilamide. *J. Am. Med. Ass.* 1938 110 252

The toxicity of sulfanilamide has been the subject of experimental study on mice, rabbits and dogs. The evidence of acute toxicity when single large doses were administered, was more conspicuous than the evidence of chronic toxicity when smaller amounts were given over a period of weeks. Most conspicuous among the signs of acute toxicity was the evidence of cerebral intoxication and acidosis. It was possible to measure the alterations in the carbon dioxide combining power of the blood of animals given the drug and to show that the acidosis was a result of alkali deficit induced by the drug associated with alkaline urine. There was little evidence of chronic toxicity as judged by the effect on growth, blood counts and the histological appearance of animals upon which an autopsy was performed. The authors conclude that as far as may be judged from animal experiments sulfanilamide is relatively non-toxic.

In discussing the toxicity of the drug for human beings it is pointed out that the drug is probably somewhat more toxic for them than for the experimental animals used. The most serious of the toxic effects reported in human beings must however be accounted for on the basis of idiosyncrasy. These effects include acute hemolytic anemia and possibly agranulocytosis. The cerebral symptoms, acidosis

and cyanosis noted in human beings are direct toxic effects not in themselves severe unless modified in their consequences by a factor of idiosyncrasy. Evidence of toxicity sufficient to warrant withholding the drug from patients when definite therapeutic indications for its use exist has not been found. However, sulfanilamide should not be used indiscriminately because severe toxic effects may be produced in the occasional hypersensitive individual.

JOHN LOCKWOOD, M.D.

Ravina A. Indications and Dangers of Para-Aminophenylsulfamide (Indications et accidents du para-amino-phényl sulfamide). *Presse méd.* Par 1938 46 331

Ravina notes that chemotherapy of microbial infections has advanced rapidly in the past few years and a number of preparations are available that are effective against various micro-organisms, especially streptococci. In 1932 Klarer and Metsch produced protosol hydrochloride of sulfamido chrysoidine and subsequently a number of closely allied preparations were produced. In 1935 Trefouel, Hitt and Bovet showed that the therapeutic activity of these substances was due to the presence of para-aminophenylsulfamide. This compound has a relatively simple chemical formula ($\text{NH}_2\text{SO}_2\text{NH}_2$) it has been designated by a number of synonyms, such as sulfanilamide, sulfonamide and sulfamide. Moreover a considerable number of special preparations have been manufactured such as protosol, album sulfonamide P, and antistreptine.

A number of investigators have shown that para-aminophenylsulfamide has a definite therapeutic action against streptococci, gonococci and meningococci. It has been employed in the treatment of various streptococcal infections, gonorrhea and meningitis. It may be given by mouth or by injection. In meningitis it is given intraspinally as well as by subcutaneous injection. Bohlman has reported that he has also found it of value in gas gangrene in addition to the specific serum; it may also be used prophylactically in cases in which infection from gas gangrene is feared. For both treatment and prophylaxis in gas gangrene sulfanilamide is given by mouth. For prophylaxis from 2 to 3 tablets of 0.30 gm. are given every four hours in treatment; larger doses are required.

Unfortunately para-aminophenylsulfamide which is undoubtedly effective in the treatment of severe infections of various types has also been found to be definitely toxic. Reports of toxic effects have accumulated in 1937. The severity of the toxic effects varies. The symptoms may be relatively slight, e.g. malaise, headache, anorexia, vertigo and nausea. Of more serious significance are cyanosis due to methemoglobinemia or sulfhemoglobinemia, skin eruptions, numbness or formication of the extremities, diarrhea, fevers and acidosis. Serious conditions may result if the less severe toxic manifestations are not checked, such as collapse, tachycardia, agranulocytosis or anemia. A careful review

INTERNATIONAL ABSTRACT OF SURGERY

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SURGERY AND THE BASIC SCIENCES

THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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HYPERTENSION

THERE never has been agreement as to the exact character and distribution of vascular lesions associated with essential hypertension in man. In view of this fact Moritz and Oldt (1) have undertaken an extensive investigation of arteriolar changes in a large number of hypertensive and non-hypertensive patients in an attempt to discover lesions which might be characteristic of the disease, and which, therefore, might reveal information concerning its etiology and pathogenesis. They found three histological types of chronic arteriolar lesions which were present in both the hypertensive and non-hypertensive patients. The first of these lesions was intimal hyalinization, which these authors believe is characteristic of simple arteriosclerosis, and which they found progressed in extent and intensity with advancing age. The second lesion was hypertrophy and degeneration of the media, which resembled the changes which follow distention of any hollow muscular organ. This lesion occurred with somewhat greater frequency and severity in the hypertensive patients. The third type of lesion consisted of endothelial hyperplasia. It was seen in association with inflammation, when it was properly called endarteritis obliterans. It was also seen in vessels in which the capillary beds had been reduced by parenchymatous atrophy and presumably represented involuntional changes. It was also observed in cases of hypertension in which it may

have represented a primary vascular inflammation or an accelerated process of arteriosclerosis. Although relative thickening of the arteriolar wall, which expressed itself as an increased external diameter with unchanged internal diameter, was characteristic of the hypertensive cases as a group, this change was of no value in the differentiation of a hypertensive from a non-hypertensive individual; nor was it of any value in differentiation of the types of essential hypertension. Although the arteriolar changes were frequent and widely distributed in both groups of patients, one characteristic was discovered which served almost without fail to distinguish a hypertensive from a non-hypertensive individual. Of 200 cases studied, renal arteriosclerosis was present in 109, and in 97 of these chronic hypertension was present. On the basis of these results Moritz and Oldt concluded that renal arteriosclerosis is the most common cause of chronic hypertension. They further concluded that the only site of arteriosclerosis which is significant in the causation of hypertension is the kidney. We shall see that there is ample experimental evidence which supports these conclusions. A survey of the clinical histories of the subjects in regard to the rate of progress of the disease, the average age at death, and the cause of death disclosed two types of hypertension. One group of patients died of renal insufficiency, and the disease was best described as "malignant" hypertension, the other group died of heart failure or cerebral hemorrhage, and the condition was best

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sipelas and the lowest in patients with primary pharyngeal or otogenic infection. Recovery usually followed when the primary lesion was focal or amenable to surgical treatment and as a rule the patients in such cases showed increased bactericidal action of the blood against the infecting organism. Death occurred when the lesions failed to localize altogether and when the distributing lesion was inaccessible to surgical drainage.

The organisms were all of Group A (Lancefield) produced fibrinolysis and as a rule showed the capacity to resist phagocytosis and destruction in the blood of normal individuals. The blood of patients with local lesions was usually bactericidal against the homologous strain and the authors attribute this effect to increased phagocytosis. Bacteremia in hemolytic streptococcal infections is of profound prognostic significance, indicating by its presence a loss of equilibrium between the local defense mechanism and the normal clearing mechanism. The presence of specific antibodies serves to promote both localization of the infection and clearing of the blood if bacteremia occurs.

JOHN S. LOCKWOOD, M.D.

DUCTLESS GLANDS

Werner, S. C. The Thyrotropic Hormone and the Antihormone Problem. *Endocrinology* 1938
11: 191

Since the initial demonstrations that injections of hypophyseal extracts containing thyrotropic hormone will induce marked activation of the thyroid gland, it has been found that their excessive stimulation of the thyroid gland cannot be maintained much beyond four or five weeks. The basal metabolic rate

of the treated animals has been found to return to normal and the thyroid gland to become microscopically inactive upon continued treatment. It has been found that when the decline in thyroid activity occurred, doses of extract up to 100 times the original did not restimulate the gland. Similar refractoriness has been shown to develop with the other hypophyseal hormones.

Two types of hypophyseal extract were employed both of which were made from the anterior hypophyseal lobe of the cow, one by means of the sodium sulfate method and the other by the flavianic method.

A sodium sulfate preparation of the extract containing thyrotropic hormone caused refractoriness to develop in 10 of 11 guinea pigs treated up to thirty-nine days. A flavianate preparation produced stimulation in 11 of 26 guinea pigs treated for thirty-nine or more days. Small non-stimulating doses of the sodium sulfate preparation are as effective as large stimulating doses in producing refractoriness, although small doses of the flavianate preparation did not produce refractoriness in 3 of 5 guinea pigs so treated. No inhibitory substance against the flavianate preparation was found in the serum of 3 rabbits and 2 sheep treated for prolonged periods. Nine of 11 guinea pigs refractory to the sodium sulfate preparation responded with renewed stimulation of thyroid gland to the administration of the flavianate preparation.

An extract has been obtained which usually produces prolonged stimulation of the thyroid gland without the development of refractoriness. Refractoriness is thought to be an immune response to proteins associated with the hormone in the extract.

SAMUEL KAHN, M.D.



elaborates a substance which is taken up by the blood stream to produce the rise in the blood pressure Goldblatt (10) has shown that hypertension will follow constriction of the renal arteries only if venous channels are left open in order to permit access of the active principle into the circulation. Furthermore, Dicker (15) and Houssay and Fasciola (16) have reported that

ischemic kidneys from a hypertensive dog when transplanted into a normal dog produce a hypertension in the recipient Concerning the nature of the substance liberated by the kidney there is little information. It has been shown that guanidine is not the active principle (Goldblatt, Lynch, Hanzal, and Summerville, 2, Helmer and Page, 17).

KIDNEY

Several recent papers have appeared which deal with the subject of the experimental production of acute and chronic glomerulonephritis Smadel and Farr (18) and Smadel (19) have described the diffuse glomerulonephritis which was produced in rats by the injection of anti-kidney serum (nephrotoxin) prepared by immunizing rabbits to an emulsion of rat kidneys The injection of large quantities of the nephrotoxin produced an acute glomerulonephritis characterized by swelling of the intercapillary substance of the glomerular tuft and by tubular degeneration Fibrin deposition was not a constant finding. These changes were accompanied by albuminemia, cylindruria, and anasarca, but not by hematuria The blood urea mounted rapidly, the urea clearance fell, and death followed in two weeks The administration of moderate doses of nephrotoxin produced a chronic form of nephritis The acute lesions merged into scarring of the glomeruli and tubules, and represented a chronic progressive glomerulonephritis with generalized vascular lesions There was no immediate alteration of the urea clearance, but lipemia and hypoproteinemia appeared accompanied by anasarca The investigators report that the majority of the animals which survived the initial stage of the disease showed progressive changes, with albuminuria and casts until the time of death Terminally uremia, hypoproteinemia, and hypertension were observed.

Ehrlich, Wolf, and Bartol (20) have studied acute nephrotoxic glomerulonephritis in rabbits They found the disease to be characterized by a latent period, during which a hyperemia of the glomeruli was present, accompanied by diuresis They believe that these findings deny Volhard's theory that vascular spasm initiates glomerulo-

nephritis This latent period is followed by proliferation of glomerular cells, the typical lesion Fibrin deposition and crescent formation are not constant and these authors express the opinion that they indicate a complication which aggravates the disease, and are not indicative of the subacute stage When the glomerular lesions are at their peak, oliguria and albuminuria are present Results obtained with dye excretion tests reveal impaired glomerular function, without disturbance of tubular function When the disease progresses to the point where obvious tubular degeneration is present, then dye elimination tests reveal impaired tubular function also In mild cases of clinical nephritis Goodner and Smith (21) have reported that the glomerular and tubular injury progress parallel, whereas in advanced cases the tubules suffer the more serious damage

Medlar and Blatherwick (22) have studied a form of chronic glomerulonephritis which is produced experimentally in rats by a special high protein diet They observed focal injuries in the glomerular filter bed, which gradually spread to include the capsule and finally the tubules These changes progressed to a chronic degenerative nephritis with glomerular sclerosis and generalized fibrosis They did not observe the early acute lesions which, as mentioned above, were found by Smadel in the nephrotoxic nephritis However, the chronic stages of the two types of experimental nephritis were identical. For this reason Medlar and Blatherwick conclude that chronic degenerative nephritis may depend primarily upon irreparable damage to the filter bed of the kidney, and that although the etiological factors may be of many kinds, the end-result in the chronic stage is always the same.

HEART

The earlier belief that specialized conducting tissue is not present in the myocardium led to the generally accepted theory advanced by Lewis that the cardiac impulse is transmitted from the sub-

endocardial Purkinje network to the ventricular muscle by radial muscle conduction Robb and Robb (23) later suggested that the impulse emerges from the Purkinje network at the apex

described as "benign." These terms, however, were applicable only in retrospect since the course of the disease could not be predicted from its early manifestations. The factor which determined whether the disease was to run a rapid course with early death from renal failure was not the degree of hypertension, but rather the rate of progressive renal destruction. The difference between the malignant and benign forms is quantitative, not qualitative; the malignant form is more severe and it runs an accelerated course.

As mentioned above Montz and Oldt concluded that renal arteriosclerosis, presumably resulting in ischemia, is the cause of chronic hypertension. This conclusion is supported by ample experimental evidence that renal ischemia following partial constriction of the renal arteries results in chronic hypertension in dogs (Goldblatt, Lynch, Hanzal, and Summerville, 2). Their conclusion that the kidney is probably the only site where arteriosclerosis will produce this effect is also supported by experimental evidence. Goldblatt, Lynch, Hanzal and Summerville (2) produced ischemia of the spleen and of the whole lower extremities without producing a rise in the blood pressure. Rydand (3) produced coarctation of the aorta at various levels and found that hypertension resulted only when the coarctation rendered the kidneys ischemic.

The opinion that malignant hypertension differs from the benign only in its severity and rapidity of development also finds support in recent animal experimentation (Goldblatt, 2). A moderate constriction of the renal arteries in dogs produces a benign form of chronic hypertension which may persist for many years without evidence of renal failure. On the other hand, if the constriction of the renal artery is too severe the animal develops a hypertension accompanied by uremia, and death from renal insufficiency rapidly ensues. This condition more closely resembles the malignant form of hypertension as seen in man but probably represents a condition even more acute. If it were possible to produce a controllable and progressive constriction of the renal arteries in dogs it would undoubtedly be possible to simulate all the various degrees of malignant and benign hypertension, as well as the conversion of one into the other that are seen in man. Apparently when the disease develops very rapidly the kidneys are the first to fail, when the disease develops very slowly the chances that it may be terminated by heart failure or cerebral accidents are greatly increased.

There have been several recent reports on the pathology accompanying experimental hyperten-

sion in the dog. Childs (4) finds in the chronic form that the arterioles show definite medial hypertrophy with narrowing of the lumen, a change most pronounced in the gastro-intestinal tract and in the heart. Hyalinization and other changes were also observed in the kidney glomeruli. In the acute form, of which the animals died in uremia within four days, petechial hemorrhages were noted particularly in the gastro-intestinal tract and heart. These extravasations were mainly from the capillaries for the arterioles were intact. Goldblatt (5) has reported on the pathological changes to be found in the acute form, although somewhat less acute than that just described. He also observed petechial hemorrhages, but they were accompanied by degenerative changes in the arterioles consisting of hyalinization and necrosis. In the chronic form extensive hyalinization was found but no necrosis nor hemorrhages. These findings are similar to those in the clinical disease and suggest a quantitative rather than a qualitative difference in the acute and chronic forms.

In regard to the mechanism of hypertension resulting from renal ischemia, it has been well established that nervous factors are not involved either as afferent or efferent portions of a reflex arc. Section of the splanchnic nerves (Goldblatt, Gross and Hanzal 6), posterior spinal nerve roots (Goldblatt and Wartman, 7), total sympathectomy (Heymans, Bouckaert, Elaut, Bayless, and Samaan, 8; Alpert, Alving, and Grimson 9), renal denervation (Goldblatt 10; Page 11; Collins 12), and cord transection (Glenn, Child and Page, 13) have all been shown to be without effect on the development of hypertension. The significant point in these experiments is that complete loss of sympathetic vasomotor tone is unable to prevent the hypertension. Goldblatt (10) suggests that the occasional beneficial effects noted clinically from various surgical procedures which involve section of the vasoconstrictor nerves to the kidney are probably due to production of renal vasodilatation with consequent alleviation of the renal ischemia. If this is true, the frequency and degree of success should be the same following denervation of the kidney alone. Of course, such a procedure could not be effective if the arteriosclerosis has advanced to the point where the vessels are no longer capable of dilating. That retention by the kidney is not a factor is shown by the fact that hypertension is not produced by nephrectomy or complete ligation of all the renal arteries (Goldblatt, 10), nor by diverting the ureters into the blood stream (Geer and Dragstedt, 14). There is now some evidence that the mechanism is a humoral one, that the kidney

which enables the ventricle to continue to perform its work quota. When this compensatory increase in the diastolic volume fails to keep pace with the decrease in the contractile power, the ventricle becomes unable to perform its work and progressive irreversible heart failure ensues. This decline in work done is due not only to a sharp fall in the total energy released, but also to a terminal decrease in the efficiency of energy utilization, or conversion into work. It had previously been believed that a diminished efficiency of the heart played a prominent part in the development of heart failure, but Katz and Mendlowitz maintain that it is only a terminal phenomenon.

The question has never been completely settled as to whether cardiac hypertrophy will result from increased work alone, or whether injury to the heart is an essential contributing factor. That a certain degree of extra work performed by the heart does not necessarily lead to cardiac hypertrophy is indicated by the recent work of Van Liere and Sleeth (30). These investigators determined the ratio of heart weight to body weight in a series of pregnant guinea pigs, cats, and dogs, and were unable to find any demonstrable hypertrophy.

Histological changes in the myocardium in cardiac failure and hypertrophy are rather meager. Recently, Shipley, Shipley, and Wearn (31) in rabbits, and Roberts, Wearn, and Bodal (32) in human material have demonstrated that

in the hypertrophied heart the muscle fibers are greatly enlarged, but that the ratio of the number of capillaries to the number of fibers remains unchanged, a fact which shows that the capillaries do not multiply to keep pace with the enlarged muscle mass. They were able to show that the increase in the volume of muscle tissue which must be supplied by each capillary is approximately proportional to the degree of cardiac hypertrophy. The relationship of this presumably diminished blood supply to the development of heart failure is obvious.

Because of the meager histological changes which accompany heart failure, Herrmann and Decherd (33) and Decherd and Blum (34) have investigated the chemical changes which occur under these conditions. Since it is well known that the potassium salt of creatin phosphoric acid is involved in the chemical transformations which liberate the energy necessary for muscular contraction, these workers have first directed their attention to the study of these compounds. They have found that the hypertrophied heart, whether from clinical or experimental material, shows an increase in creatine content, suggestive of increased activity. In hearts which have failed, however, they have observed a marked fall in potassium, creatine, and non-lipoid phosphates. Continuation of such experiments may contribute important information for an understanding of the process of heart failure.

CIRCULATION

Friedlander, Silbert, Bierman, and Laskey (35) have offered an explanation for the failure of ganglionectomy and paravertebral injections of alcohol to relieve intermittent claudication. In human subjects thermocouples were employed to record superficial temperatures and temperatures deep within the muscles. Temperature changes served as an index to the blood flow in these areas. It was found that spinal anesthesia and anesthesia of the spinal roots, which eliminated sympathetic influences from the limb, resulted in an increase in the superficial circulation, but had no effect on the blood flow through the muscles. The intravenous administration of hypertonic salt solution produced a definite increase in the blood flow through both the superficial and muscular tissue. This provides experimental evidence supporting the use of hypertonic salt solutions in the treatment of intermittent claudication.

Alam and Smirk (36) have demonstrated in man that exercise of a limb or a portion of a limb

while circulation is restricted by means of a sphygmometer cuff elicits a reflex rise in the blood pressure and pulse rate. The reflex is elicited by the action of retained metabolites upon the sensory endings in the muscle itself. This is presumably a mechanism for assuring an adequate supply of blood to the exercising muscles. Pain of the intermittent claudication type is also produced under these circumstances. Recently Maison and Forster (37) have shown that a change in pH is not the factor which stimulates the pain receptors in ischemic muscles during exercise.

It is now widely accepted that one of the primary factors in traumatic shock is the oligemia which results from loss of blood and plasma into the injured area, and perhaps into the tissues in general, if the blood pressure remains below a critical level for a considerable length of time. For this reason methods of restoring the blood volume assume immense practical importance. It has been repeatedly demonstrated that the

and passes toward the base of the heart in paths parallel to the muscle fibers. Recently Abramson and Margolin (24) demonstrated the presence of a Purkinje network continuous with the subendocardial system, which extends throughout the myocardium and interventricular system. In experiments on the heart of the dog Abramson and Jochim (25) found that the cardiac impulse was not necessarily conducted parallel to muscle fibers, but could be transmitted in any direction as demanded by the presence of the myocardial Purkinje network. According to their view the impulse spreads from the subendocardial network into the myocardial network and activates practically the whole ventricle simultaneously. Myocardial conduction is not a delayed conduction through muscular tissue as formerly believed, but a rapid conduction through neuromuscular tissue.

There are many contradictory reports in the literature concerning the effect of drugs and physiological states on the flow of blood through the coronary system. Recent studies on the coronary flow in dogs reveal that the methods employed to measure coronary flow have not been reliable, and therefore are probably responsible for inconsistent and contradictory results. As pointed out by Katz, Jochim, and Bohning (26) the rate of blood flow through the coronaries is determined directly by three variables: (a) the pressure gradient between the inlets and outlets of the coronary system, (b) the vasomotor tone of the coronary vessels, and (c) the passive changes in the caliber of the coronary vessels produced by changes in the degree of contraction of the surrounding cardiac musculature. These investigators have recently studied the effects of the last mentioned variable on the coronary flow in the isolated perfused heart of the dog under conditions in which the various factors could be rigidly controlled. They report that with all other factors constant the coronary inflow is inversely related to the intramuscular pressure, which itself is a direct function of the intraventricular pressure. On the other hand, the coronary outflow increases with increase in the intramuscular pressure. From these observations they are forced to the conclusion that under certain conditions the blood supply to the heart may vary inversely with the work it is doing. They consider the possibility that this vicious mechanism may operate in the normal animal upon excessive exertion, or in acutely developing hypertension and perhaps also on moderate exertion when the coronaries are diseased. They found also that under certain conditions in the isolated heart, the outflow from the coronary vessels may

exceed the inflow through the coronary arteries as a result of participation of the thebesian channels. They state that the pressure gradients which regulate the rate and direction of flow in the thebesian passages operate during the cardiac cycle in such a way as to produce a significant ebb and flow through these channels.

Katz, Jochim and Weinstein (27) have studied in greater detail the extent to which the various branches of the coronary system participate in carrying the total blood flow to the heart. They found that the contribution to the total flow made by the various branches varies widely in regard to both inflow and outflow. These wide variations they believe vitiate the conclusions obtained from experiments in which the measured outflow from the coronary sinus has been used as a quantitative index to the effect of various drugs and procedures on the total coronary flow. Previous workers had believed that 60 per cent of the total outflow constantly passes through the coronary sinus. The results of Katz, Jochim, and Weinstein indicate that this value is not only extremely variable, but is probably too high. That portion of the outflow not carried by the coronary sinus empties by way of the thebesian channels mainly into the right heart. They suggest that this may account for the lower incidence of infarction in the right ventricle as disclosed by autopsy material. It was found that constriction of the coronary sinus decreased the coronary inflow, and led to failure of the isolated heart.

Esset, Herrick Baldes and Mann (28) have studied the effect of digitalis on coronary inflow employing a special technique which permitted observations over a long period of time in unanesthetized dogs maintained in perfect physical condition. Digglusin was administered intramuscularly over a period of days in quantities more than sufficient to digitalize the animals without the production of any significant change in the blood flow through the circumflex branch of the left coronary artery.

Katz and Mendlowitz (29) have analyzed the metabolic and mechanical changes which accompany spontaneous heart failure in the isolated perfused heart of the dog. They state that failure of a ventricle is characterized by the ventricle's doing less work at a given diastolic volume, or by its doing the same amount of work at a greater diastolic volume. This decrease in the ratio of diastolic volume to work is apparently a mechanical expression of the decreased contractile power of the ventricle. Dilatation is therefore, an effect of the failure as well as a method of compensation.

that much of the present discussion has been taken.

Recent investigations concerning the comparative anatomy of the cerebellum have contributed valuable information and a new systematic terminology to replace the previous difficult terminology (Larsell, 45). This terminology divides the cerebellum essentially into three main divisions which are phylogenetically, anatomically, and functionally distinguishable. The most primitive of the three divisions is the flocculonodular lobe whose connections are solely vestibular. It is functionally concerned with equilibration. A somewhat less primitive portion, the paleocere-

bellar division of the corpus cerebelli, has mainly bulbar and pontine connections. Since its ablation produces exaggerated stretch reflexes and hypertonia of the antigravity muscles, it is mainly concerned with the postural tone and reflexes. The third portion, the neocerebellar division of the corpus cerebelli, has connections mainly with the cerebral cortex. It is concerned with the regulation of volitional movements and its ablation produces tremor, dysmetria, and asynergia. In primate monkeys and in man a permanent hypotonia is also produced. These facts are itemized and shown in more detail in the following outline:

THE DIVISIONS OF THE CEREBELLUM

- I. The flocculonodular lobe (most primitive)
 - a. Connections: vestibular nuclei
 - b. Ablation produces: disturbances of equilibrium, such as swaying and staggering
- II. Corpus cerebelli
 - A. Paleocerebellar division
 1. Includes: Anterior lobe of corpus cerebelli (lingula, centralis, and culmen); paleocerebellar portion of the posterior lobe of the corpus cerebelli (pyramis, uvula, paraflocculus)
 2. Connections: reticular formation of the midbrain, pons, and medulla via the fastigial, globose, and emboliform nuclei, vestibular nuclei to slight extent
 3. Ablation produces: exaggerated stretch reflexes, and supporting reactions, augmentation of decerebrate rigidity, slight disequilibrium
 4. Stimulation produces: inhibition of decerebrate rigidity, limb movements followed by rebound
 - B. Neocerebellar division
 1. Includes: posterior lobe of the corpus cerebelli (simplex, ansiformis, paramedianus, declive, tuber)
 2. Connections: red nucleus, and thalamus via dentate nucleus and to some extent the globose and emboliform nuclei: fibers from the thalamus pass to the cerebral cortex
 3. Ablation produces: disturbances of volitional movements, including tremor, dysmetria, and asynergia, in the higher forms permanent hypotonia is produced
 4. Stimulation produces: no movements, but changes in cerebral activity

The neocerebellum is concerned with regulating volitional movements entirely. This relationship between the cerebellum and the motor cortex has recently received considerable attention. Aring and Fulton (46) observed in monkeys that ablation of the motor area of the cerebral cortex abolishes the tremor of voluntary movements which is produced by cerebellar ablation. Removal of the premotor area, on the other hand, exaggerates this cerebellar deficiency, and renders the animal incapable of compensating for the cerebellar deficit. Walker (47) has demonstrated anatomically the existence of a fiber tract which arises in the cerebellum and passes by way of the superior cerebellar peduncle to the thalamus, whence a second neurone extends to the motor cortex. Walker (48) has also presented physiological evidence for the existence of this pathway. He found that stimulation of the cerebellar hemispheres (neocerebellar) resulted in an increase in the frequency and amplitude of cortical action potentials recorded from the motor cortex. This effect was abolished by sectioning of the superior cerebellar peduncle. He expresses the view that the action of the neocerebellum is to lower the threshold of excitability of the motor cortex, a fact demonstrated years ago by Rossi (49). After removal of this "sensitizing" effect of the cerebellum the motor cortex will respond only to stimuli of high threshold and will give responses which are not nicely adjusted to the requirements. This would perhaps account for the delay in initiating reactions, the decomposition of movements, the tremor, dysmetria, and adiadochocinesia so characteristic of cerebellar lesions.

The paleocerebellum is present throughout the phylogenetic series and performs the same functions throughout. These functions are, to some

administration of saline solution in shock maintains the blood pressure only temporarily, and frequently only during the period of injection. That such treatment may be injurious as well as ineffective has also been shown. Davis (38) has reported that the conditions of anoxemia and reduced oxygen consumption in experimental shock are aggravated by the administration of saline solution because this procedure augments the loss of blood protein and cells into the traumatized area, and to some extent into the tissues in general. Hepler and Simonds (39) have shown in experimental shock in the dog that large quantities of injected salt solution are very rapidly lost from the circulation, which causes edema in the gastro intestinal tract and probably in the liver as well. They found the lumen of the stomach to contain as much as 200 c. cm. of clear fluid after injections of saline solution. If there is a traumatized area or if the blood pressure has remained low for a period sufficient to increase the capillary permeability, it is only to be expected that even a temporary increase of the blood pressure by means of saline injections will hasten the loss of necessary blood cells and blood protein from the circulating fluid. Furthermore, simple reduction of the colloid osmotic pressure of the blood by continuous dilution with saline solution will tend to promote edema, a complication which can only aggravate the situation. In a normal or dehydrated individual excessive amounts of fluid can be easily tolerated, but this has not been found to be true in the individual who is suffering from shock.

Solutions of gum acacia in saline solution have been widely used as a substitute for pure saline solution for the restoration of the blood volume. Its colloid osmotic pressure retains it within the vascular system so that it is apparently as effective as serum for the maintenance of the blood pressure after hemorrhage in dogs (Robertson 40). However, Heckel, Erickson, Yuile and Knutti (41) have reported that injections of acacia reduce the plasma proteins in normal dogs. Low levels of plasma protein accompanied by marked histological changes in the liver may be maintained for weeks by repeated injections.

These workers consider that this effect may be due either to liver injury with inability on the part of the patient to form blood protein, or to a compensatory decrease in the protein formation, the purpose of which is the maintenance of a normal blood osmotic pressure. That hepatic injury may be at least partially responsible is suggested by the work of Hall (42). This investigator found that the injection of acacia into dogs reduces the plasma protein including fibrinogen and that this is accompanied by impaired liver function as revealed by galactose and glucose tolerance tests. The clinical use of acacia is therefore not without its dangers. No satisfactory substitute for fresh blood exists when a transfusion is indicated.

Obviously the ideal treatment for blood loss or oligemia is a blood transfusion. However, the expense and inconvenience of the usual blood transfusion has stimulated attempts at the storage of blood obtained from normal individuals, placentas, and even cadavers. Davis and White (43) have recently suggested that peritoneal transudates might provide an easily available and inexpensive substitute for blood. They found that ascitic fluid contained from 2 to 3 per cent protein with an albumin globulin ratio of 1:1 to 2:3, and should therefore be able to contribute significantly to the colloid osmotic pressure of the blood of a transfused subject. In anesthetized dogs after hemorrhage, they found that ascitic fluid was effective in the restoration of blood pressure and that the effect persisted long after the cessation of the injection. The animals survived the hemorrhage, the transfusion and the anesthesia without immediate or delayed deleterious effects. Ascitic fluid to be used for this purpose is subjected to a Kahn test and its sterility is tested by blood agar cultures. Because antibodies are present in the fluid it must be tested for compatibility with the recipient's blood. The advantages of ascitic fluid are that it can be stored for long periods in the cold without preservatives and yet remain sterile, it contains human proteins, it is available in any large hospital and costs nothing; however, no satisfactory substitute for fresh blood exists when a transfusion is indicated.

CEREBELLUM

The functions of the cerebellum have never been clearly understood. There has never been complete agreement in regard to the effects produced by removal of this portion of the brain. Localization of function has been reported to be non-existent on the one hand and as definite as

in the cerebral motor cortex on the other. Within recent years, however, important advances have been made which promise to clarify to a great extent the function of the cerebellum. The newer knowledge has been excellently reviewed by Fulton and Dow (44) and it is from their review

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Jones, W. A.: Further Observations Regarding Familial Multilocular Cystic Disease of the Jaws. *Brit J Radiol*, 1938, 11 227

The writer of this article describes a form of multilocular cysts occurring in 4 children of the same family, and compares these disorders to a similar one in another patient, the description of which was put at his disposal by Thomas of Savannah, Georgia.

The disorder described affects both the mandible and the maxilla simultaneously, causes a bilateral protuberance of the cheeks and jaws and a slight fullness and upward turning of the eyes, revealing the white sclera beneath. This gives the children a peculiarly grotesque, cherubic appearance which induced the writer to coin the word "cherubism" to give the condition a name. Associated with this bony expansion is a swelling in the submaxillary regions which is caused by hyperplasia of the lymph glands, and comes on in the early stage of the affection and later disappears.

In the oldest child thymic attacks were observed, which cleared up under x-ray therapy. The second child at the age of five showed a rather marked secondary anemia, was listless and felt somewhat ill when her lymph glands became enlarged, there was, however, no rise in temperature and no change in the white blood count. The other children remained healthy and active while the disease developed. Wassermann reactions were negative. In the oldest boy serum phosphorus and phosphatase showed an increase, while the blood chemistry remained normal in the youngest child.

The parents of the author's patients were of the Hebrew race and of Russian ancestry, they had 5 children of whom 4 were affected, but there was no evidence of a like condition in the previous generation. Thomas' patient was a boy aged eleven, with multiple cysts in both jaws, but with no glandular involvement. His family history, however, was of interest. A genetic chart included in this article showed the descent of the anomaly through 5 generations.

The Hebrew children were aged twelve, eleven, ten, and seven years, and eighteen months, all were boys except the second. The 3 older children were under observation for six years. The child aged seven was not affected and the child eighteen months old was just about to show the effect of the disease, which seemed to begin to present symptoms from the end of the second to the end of the third year of life.

The roentgenograms of the older children taken six years ago show a polycystic condition affecting



Fig 1.

practically the entire mandible as well as the maxilla. The small osteolytic areas making up the multicystic condition shown at that time became enlarged during the course of the disease, and after six years the roentgenogram showed enlargement of the individual cysts, a decrease in the thickness of the intervening bone septa, and marked expansion of the cortex. The roentgen examination also showed many retained and irregularly placed teeth, although some were shed during the time of observation. Radiographic examination of the skull, chest, and other bones revealed no evidence of any abnormality.

Pathological examination was made only on an excised lymph gland. It showed diffuse fibrous overgrowth and marked endothelial proliferation in the sinuses.

The writer considers the condition as an anomalous development of dental structure with formation of cysts, some of which contain teeth, while others do not contain teeth and are presumably formed from proliferating enamel epithelium which has failed to produce a tooth anlage and degenerated instead into a cyst membrane. There has been no pathological examination made of tissue excised from the jaws, and other diagnoses suggested by the writer, such as adamantinoma and fibrocystic disease, while unlikely, cannot be definitely excluded.

Therapy should, according to the writer, be confined to orthodontic treatment of the erupted teeth. For the jaws he recommends mastic inactivity, and for posterity sterilization of the carriers of these abnormal genes.

LEPT H THOMA, D M D

extent, the opposite of those of the neocerebellum. The greater development and predominance of the neocerebellum in the primates and man probably accounts for the fact that complete cerebellar ablation produces hypotonia in these forms in contrast to the opposite effects in cats and dogs

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well as in the granulating walls of the abscess cavity and on the inner surface of the bony cortex beneath the dura.

JAMES C. BRASWELL, M.D.

NOSE AND SINUSES

Larsell, O., Veazie, L., and Fenton, R. A.: Streptococcal Infection of the Lungs from the Paranasal Sinuses: An Experimental Study. *Arch Otolaryngol*, 1938, 27 143

Recent experimental studies have shown that probably the most important pathway of infection from the nasal accessory sinuses is a route combining the lymphatic and blood vessels from the sinuses to the pulmonary capillary bed via the right side of the heart. These conclusions were reached following the injection of trypan blue into the sinuses under conditions which precluded the tracheal pathway to the lungs. Later, the dye was found in phagocytes in the lungs and at various points along the route indicated.

The present experiments were undertaken to determine if cultures of streptococci introduced into the sinuses followed the same route in animals as in man.

The material consisted of rabbits and cats and, as a rule, inoculation was made into the frontal sinuses or into the paralaryngeal lymph node which drains these sinuses. Some of the animals were killed, others died at varying intervals, and at autopsy most of the animals showed evidence of infection. Only when the beta streptococcus was found was the evidence deemed positive. The histological study showed these organisms to be virtually absent from the bronchial passages, but they were present in the parenchyma and in the lymphatic vessels.

Viable streptococci, as shown by bacteriological methods, can reach the lungs from the paranasal sinuses and the related regional lymph nodes.

The number of organisms which reach the lung is much smaller when the sinuses are inoculated than when the bacteria are introduced directly into the paralaryngeal lymph nodes, which serve as filters for the lymphatic stream from the sinus region.

The fact that streptococci reach the lungs, liver, and spleen from the paralaryngeal lymph nodes when either the sinuses or lymph nodes are inoculated, indicates that the anatomical pathway must be via the paratracheal lymphatic vessels to the great veins and thence into the right side of the heart and into the pulmonary capillary bed. From this point they may reach the pulmonary tissues or may be carried by the blood stream to other parts of the body. Most of the organisms that pass through the lungs are apparently filtered out of the blood stream by the spleen and by the Kupfer cells of the liver.

JOHN F. DUFFY, M.D.

Malan, E.: Surgery of the Osteomas of the Facial Sinuses (Chirurgia degli osteomi delle cavità pneumatiche periffacciali). *Arch ital di chir*, 1938, 48 1

Osteomas should be considered as true tumors. They should be differentiated from ossifying tumors

in which the ossification is merely an epiphenomenon in the development of the tumor, and from hyperplastic and hypertrophic forms of ossification, exostoses and hyperostoses.

Osteomas vary in size from a pea to an egg or larger. They develop very slowly at the beginning. Growth proceeds from the nucleus of origin. Occasionally other nuclei develop and give rise to a knobby growth. The shape of these tumors is also determined by the shape of the cavity in which they grow. The tumor usually molds itself in the sinus, following the path of least resistance it breaks through osseous partitions into other adjoining sinuses or cavities. In this manner dumbbell-shaped tumors arise, and in these recurrence is possible if the primary segment is not removed.

Histologically, osteomas are covered by a layer of ciliated paranasal epithelium, and periosteum. The tumor proper is composed of varying amounts of spongy, compact or eburnated bone, and is named according to the chief component. The older the tumor is, the harder its composition. The peduncle from which the vessels supplying the growth issue is always made of spongy bone. The mucosal covering of the tumor is subject to the pathological changes of nasal mucosa in general. Mucosal cysts and polypoid changes are to be considered as concomitant occurrences and not due to the presence of the tumor. Osteomas of different structural makeup have been described: osteoblastoma, osteo-angioma, osteo-myxoma, cartilaginous inclusions, chondro-osteoma, and osteofibroma. These should be considered as transitory forms of osteomas, heterotopic ossifications, or bony tumors in which the prevalence of one tissue has altered the structure of the bone. Osteomas do not become malignant.

Osteomas usually initiate their growth at puberty. They probably arise from residual embryonal rests. The cause of the first impulse to growth is not known. It is established, however, that trauma and infection of the nasal mucosa are important in initiating the growth. Osteomas grow very slowly.

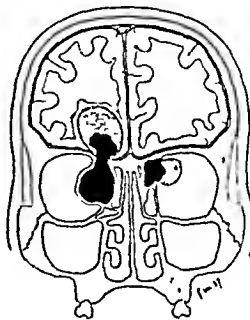


Fig 1

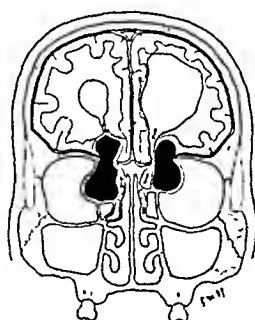


Fig 2

Fig 1 Schema of the formation of an ethmoidal orbital mucocele (right), and of an ethmoidal cranial mucocele (left). Fig 2 Schema of the formation of intracranial (right) and intraventricular (left) pneumatocele.

EYE

Reese A B Precancerous Melanosis and Diffuse Malignant Melanoma of the Conjunctiva
Arch Ophth 1938 19 354

Precancerous melanosis may occur in a previously normal conjunctiva followed by diffuse malignant melanomas. Eight such cases are reported in detail.

The average age at which the lesion was first noticed was forty eight and the average time before malignant changes occurred was five years. The precancerous areas were always diffuse and some times involved almost all of the conjunctiva. Severe inflammation sometimes accompanied the increase in size and pigmentation of the growing lesions as is the case with an analogous condition of the skin.

During the precancerous stage irradiation with radon tubes may be effective but the treatment of choice is early exenteration since much of the conjunctiva is involved. A Thiersch graft should be applied to avoid a long series of dressings.

SAMUEL A DURA MD

Tooke F T A Melanoma of the Iris with Pathological Findings
Brit J Ophth 1938 21 133

The author gives a very good historical account of melanoma of the iris and a most interesting case report of a young medical student who was required to make a very difficult differential diagnosis of this condition.

He states that the question has been not so much the clinical history of the case and its subsequent behavior following operative interference but rather the genesis of the hyperplasia of pigment producing cells, the origin and character of these cells and rôle they play in the formation of what some regard as a simple hyperplasia of pigment cells and others as a true tumor. The argument regarding the derivation of the cells responsible for pigmented growths has been waged by authorities of undoubted reputation, but apparently the end is not yet.

The opinions advanced up to date regarding the origin of these cells are as follows:

1 They arise from the epithelium or are epithelial in origin (Urbán Kromeyer Marchand, Gullerstr)

2 They are mesoblastic in origin and are
a Young connective tissue cells (Simon Kirschow Riecke)

b The result of proliferation of the lymphatics (von Recklinghausen Lubarsch Hirschheimer)

c Growths from the endothelium and perithelium of the blood vessels (Pick Jodassohn)

d Growths from the sheaths of the nerve fibers (Soldau)

The development of the iris is partly from epiderm and partly from mesoderm each part has its own particular system of pigment cells. The cells in the anterior portion of the iris or the mesodermal portion are analogous to the pigmented cells of the choroid they are generally termed chromatophores. However, they are more precisely termed meso-

dermal melanoblasts and correspond to the cells encountered in Mongolian spots of the skin. They are 'dopa' positive at least in embryonic life and apparently may vary in their 'dopa' reaction and manifest in this way a dual function.

In contrast to the mesodermal melanoblasts we have the ectodermal melanoblasts which occur on the back of the iris and are an extension of the retinal epithelium. They are ectodermal in origin and analogous to the pigment of the epidermis of the skin.

Tumors in this retinal layer, as those in the epidermal derivations of the skin take the form of pigmented papillomas or warts. They frequently occur in the horse and may protrude into the pupil as Treacher Collins has shown. Some authors refer to them as melanomas or as papillary epitheliomas of the inner layer of the iris. Their cells are large and epithelial in character, and differ in form from the spindle or fusiform shape of the mesodermal melanoblastic elements. The growths are true tumors with supporting blood vessels and stroma.

LESLIE L MCCOY MD

EAR

Lindsay J R Suppuration in the Petrous Pyramid
Ann Otol Rhinol & Laryngol 1938 47 3

The author states that meningitis of otic origin is common in comparison to meningeal infections of other origin. Of 28 cases of meningitis of all types from which the necessary pathological material could be obtained 15 cases occurred in the course of acute otitis media. The next most frequent type was tuberculous meningitis of which there were 5 cases in the group while infection of the frontal and sphenoid sinus each accounted for a additional cases of meningitis.

In 9 of the 15 cases the route by which the infection traversed the temporal bone and invaded the meninges could be traced definitely by a histopathological examination. Two cases could not be considered because the parts of the temporal bones which had been removed at autopsy were inadequate for study. In the remaining 4 cases it was possible to rule out any direct spread of suppuration through the petrous pyramid either by means of pneumatic spaces or through the bone marrow. It seems probable that the meningeal infection may have been hematogenous in origin in these 4 cases and in 2 of them a concurrent pulmonary infection was probably the source of a blood stream invasion.

It was found in every instance that the predominating pathological lesion was a suppurative process within pneumatic spaces which had produced destruction of cell partitions and had eroded through the cortex either directly or along preformed vascular channels in the bone to the middle or posterior cranial fossa or both. In nearly every instance considerable osteogenesis had occurred in the granulation tissue both in the lining of infected pneumatic spaces and in adjacent marrow spaces as

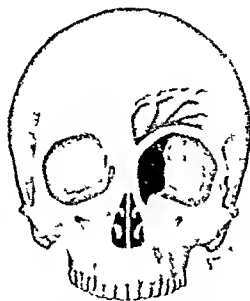
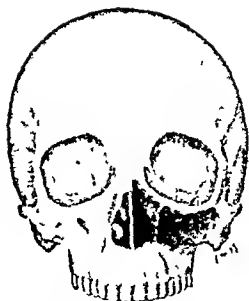


Fig 3 (left) Denker's operation for the maxillary sinus
Fig 4 (right) Kilian's operation for the frontal sinus

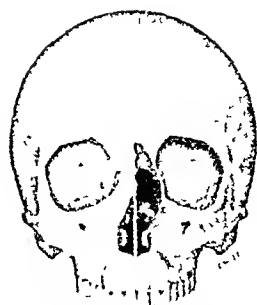
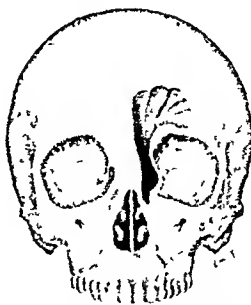


Fig 5 (left) Kuhnt's operation for the frontal sinus
Fig 6 (right) Transmaxillonasal operation of Moure

the meninges may be perforated and give rise to meningitis or brain abscess. Of all the examinations the radiological is the most essential because it is the most positive and indicates the surgical approach. Postero-anterior and lateral films should be taken routinely while occasionally special projections are indicated. On the films osteomas present themselves as very dark shadows clearly delineated. Their relation to the sinus walls is usually clearly seen and the peduncle is often visualized.

Complications of osteomas are due to the direction of the growth of the tumor and not to its size. Large osteomas may not cause any complication, while small ones with intracranial encroachment may prove fatal. Within the sinuses the most frequent complications are sinusitis, mucocele (Fig 1), and vacuum sinus. Intracranial complications include meningitis, extradural abscess, cerebral abscess and extradural, intracerebral, and ventricular pneumatocele (Fig 2).

The only therapy for osteoma is surgical removal. This, however, is not immediately indicated in all cases. Many cases are asymptomatic and discovered accidentally by x-ray examination. These do not give any annoyance to the patient and are not dangerous to his health and should not be removed. Immediate removal of these tumors is also contraindicated by the fact that some cases show permanent arrest of development. Operative indication becomes positive only when signs of invasion or facial disfigurement are present. When extirpation is undertaken it must be complete to avoid recurrence. The operative procedures include intranasal, transnasal, transorbital, and transcranial methods.

Indications for the intranasal method are rare. Only nasal and small ethmoidal osteomas easily enucleable can be removed by this approach.

1 Under the transnasal methods are the Caldwell-Luc operation, after gingival-buccal incision exposes the canine fossa, removal of its wall exposes the maxillary sinus.

2 Denker's operation (Fig 3). Exposure of the canine fossa is obtained as in the previous operation, but more extensively in order to expose the anterior (superior) angle of the pyriform nasal aperture.

Together with the anterior wall of the maxillary sinus, this angle and part of the medial wall of the maxillary sinus are removed.

3 Kilian's operation (Fig 4). An incision is made along the supra-orbital line and prolonged toward the root of the nose. The frontal and orbital walls of the sinus are removed and only a small bridge of bone corresponding to the orbital margin is left. The frontal process of the maxillary bone is removed and the superior ethmoid is destroyed.

4 Kuhnt's operation (modified) (Fig 5). The incision is the same as in the Kilian operation. The anterior wall of the sinus including a part of the orbital wall is removed, the frontal process of the maxillary bone is resected, and a nasofrontal canal widest across the anterior ethmoid is formed.

5 Moure's operation (Fig 6). Paralaronasal rhinotomy. The nasal bone of the same side is resected and the nose is bent to the opposite side. The frontal process of the maxilla is removed so as to open the maxillary and ethmoid sinuses. Through this breach the maxillary, ethmoid, and sphenoid sinuses can be approached. The incision can be extended above to open the frontal sinus and the orbit and also downward with splitting of the upper lip to expose the canine fossa and the palate.

The transorbital method is used in Cirincione's operation. A long deep incision is made along the internal margin of the orbit and the medial third of the superior margin. Subperiosteal exposure of the medial and part of the superior walls of the orbit is obtained by pushing the eyeball externally. The subperiosteal route is essential in order that the trochlea may be saved.

In the transcranial method a frontoparietal osseouscutaneous flap is turned and the frontal lobe is lifted to expose the superior wall of the orbit and frontal sinus, and these walls are demolished in order that the tumor may be exposed and removed. Reduction of the intracranial pressure is essential for a good exposure. This is accomplished either by means of ventricular puncture after the flap has been turned, or, better, by continuous spinal drainage during the preparation of the patient and turning of the flap. After the brain has been exposed the spinal needle

and irregularly until they are attached to their point of origin by a stalk or peduncle. The zone most easily invaded by these osteomas is the orbit because on this cavity all the other nasal cavities border and because its walls offer little resistance to the invading tumor. At times the main body of the osteoma detaches itself from its stalk and lies free as a foreign body in a cavity.

The frontal sinus is most commonly involved near the anterior pole of the ethmoid sinus. In the early stages the tumor occupies the sinus without deforming it and it can be diagnosed only with x rays or by means of concomitant infection or closure of the nasofrontal duct. As the tumor grows the walls of the sinus become deformed. The wall nearest the tumor is first involved. The most frequent directions of growth are toward the opposite side toward the orbit and toward the cranium. During the period of deformation the symptoms are those of skeletal changes of the frontal bone which are sometimes visible and pain due to compression of nerves or meningeal irritation. When the tumor invades other cavities symptoms of invasion of the cavities occur.

The ethmoid sinus is involved about one third as frequently as the frontal sinus. Osteomas in this sinus easily break through the lamina papyracea and invade the orbital cavity.

The sphenoid sinus is the least frequently involved. Most cases are small osteomas of spongy makeup. However some very large sphenoid osteomas invading other cavities as well as the cranium have been described.

The maxillary sinus is involved less frequently than the frontal or ethmoid. The early development of the tumor is asymptomatic. As it externalizes facial distortion takes place. The palate may be modified or eroded. The pterygomaxillary fossa may be involved as well as the orbit or nasal cavity. Cases of a free tumor in the maxillary cavity have been described and also cases in which tumors were found in both sides.

Osteomas of the nasal cavities are rare. They are usually extensions from the sinuses. Occasionally they arise from the nasal septum from the inferior cornu or from the palate including the pterygo maxillary fossa. In these cases the tumor usually projects into the pharynx.

The frequency of osteomas of the orbit has not been definitely established. More than half of the cases are invasions from the frontal, sphenoid or maxillary sinuses. Many other cases are exostoses or hyperostoses or manifestations of general or local bony diseases.

The subjective symptoms of osteoma of the sinuses include:

1. Pain. Initially the pain is occasionally neuralgic in character, intermittent rarely constant frequently irradiating and very difficult to localize. Later the pain becomes localized. It is due to the compression of nerves by the tumor. In the maxillary sinus the infra-orbital nerve is involved while

in the frontal and ethmoid sinuses the supra-orbital and nasociliary nerves cause the pain. When the nasociliary nerve is compressed the syndrome of Charlin results. Pain may also arise from the formation of a vacuum in the frontal sinus formation of a mucocoele, or by occlusion of the frontonasal duct.

2. Headache. This symptom is frequent. At the beginning it is moderate and intermittent while later it is severe and constant. Very severe headache is usually caused by invasion of the cranium. When the headache is accompanied by rhinorrhea fracture of the skull and pneumatocele should be suspected.

3. Respiration. Difficulties in respiration are rare. Large osteomas in the nasal cavities may not cause any respiratory symptoms while occasionally small osteomas reflexively cause severe difficulties in breathing.

4. Ocular symptoms. Diplopia is not infrequent. It is due to the exophthalmos or to involvement of ocular nerves or muscles. Occasionally diminution of vision from a compression retrobulbar neuritis is seen.

5. Other symptoms. These are rare and include dysphagia psychic symptoms and anosmia.

Inspection will show facial disfigurement when present. Osteomas of the frontal and ethmoid sinuses frequently cause variable tumefactions in the superior internal angle of the orbital margin on the squama of the frontal bone or at the root of the nose. Palpation of the skin over these tumefactions is not painful. The skin is freely movable over the smooth or knobby mass. Rhinoscopy may show an intranasal mass of whitish or ivory color denuded or covered with mucosa and hard as ascertained by instrumental palpation. Anterior rhinoscopy shows the bone deformities caused by the tumors. Illumination may show opacities in the sinuses. Hemorrhages are rare. The sense of smell should be tested. Exophthalmos is the most characteristic symptom of the frontal, ethmoid, or other sinuses. The osteoma in its development pushes the globe anteriorly and downward or laterally. In the early stages it is very difficult to discern the exophthalmos. It is always unilateral and non pulsating. Various grades of keratitis parophthalmitis and chemosis may accompany the exophthalmos. Alterations in the ocular movements due to nerve or muscle compression may be demonstrated. The visual disturbances vary from a mild amblyopia to amaurosis and are caused by compression retrobulbar neuritis. The ophthalmoscope may show optic atrophy. An ocular due to compression of the ciliary nerves ptosis epiphora and conjunctivitis may also be found. When the osteoma extends upward and invades the anterior cranial fossa signs of frontal lobe compression occur. The most typical of the signs are jacksonian attacks. Other objective neurological signs are usually absent. (Encephalography may show distortion of the anterior horns of the ventricles and fine tests may bring out visual and olfactory disturbances.) With the growth of the osteoma

INTRASPINAL TUMORS; SURGICAL CONSIDERATION

Collective Review

ALFRED W ADSON, M D., F A C S , Rochester, Minnesota

P RIMARY (4, 34) intraspinal tumors are usually benign and operable, and are much more common than they are usually thought to be. These facts justify a review of the symptoms produced by and the newer methods employed in the differential diagnosis of these tumors in order that they may be recognized and removed before complete paralysis results (1, 3). These tumors may arise from all the primary tissues of the spinal canal and are about equally distributed from the cervical cord to the sacral nerves (10, 12, 13). Those that arise from the nerve roots or meninges produce characteristic root pains (11), which unfortunately are frequently unrecognized, and patients are subjected to various surgical measures without avail (Fig 1).

The first successful operation was performed by Sir Victor Horsley (2). The patient was a man, aged forty-two years, who had suffered from intercostal pain for three years. Four months previous to operation the lower extremities became weak, the weakness progressed to complete paraplegia and anesthesia below the level of the sixth and seventh thoracic roots. Severe tonic spasms occurred in the legs, and paralysis of the bladder and rectum was also present. At operation, a fibromyxoma, situated at the level of the third and fourth thoracic vertebræ, was removed. Improvement was gradual, terminating in cure within one year. Since Horsley's time, many men have contributed to the literature on the diagnosis and treatment of intraspinal tumors, and I wish space would permit an abstract of the various discussions. The monumental pioneer work of Elsberg (17) and Frazier (20) in this country has served as a stimulant and for guidance to many of us who are attempting to carry on with the treatment of intraspinal tumors.

Etiology. The specific cause of tumors of the spinal cord remains unknown. However, the same factors that are responsible for tumors in other parts of the body probably pertain to the development of tumors within the cord and meninges. Intraspinal tumors rarely develop in childhood (the youngest patient in our series was

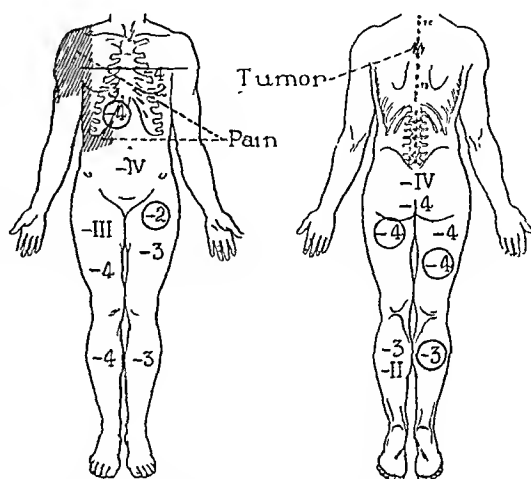


Fig 1 Situation of root-pain with subsequent loss of motor and sensory functions

aged seven years), although tumors have been reported as early as the twenty-second month of life. The third, fourth, and fifth decades of life are the ages at which most of the tumors occur (Table I).

TABLE I.—AGE INCIDENCE AND SITUATION OF 451 TUMORS OF THE SPINAL CORD OPERATED ON AT THE MAYO CLINIC UP TO OCTOBER, 1935

Age, years	Extra-dural	Intradural		Total
		Extra-metullary	Intra-metullary	
1 to 10	1		1	2
10 to 20	12	2	6	20
20 to 30	23	33	27	83
30 to 40	28	59	20	116
40 to 50	25	53	28	106
50 to 60	24	51	17	92
60 to 70	7	17	4	28
70 to 80		1		1
Total	120	210	112	451

may be withdrawn. The trans-cranial approach is safe and in the cases so far reported there has been no intracranial infection from sinus infection. When sinus infection exists the trans-cranial operation should be delayed until the infection clears up.

The article contains an extensive bibliography of 18 pages.

DAVID INFARATO M.D.

NECK

Giordanengo G. Clinical Characteristics and Anatomopathological Features of Acute Non-Suppurative Thyroiditis (*Caratteristiche cliniche ed anatomopatologiche della tiroidite acuta non suppurativa*). *Minerva med.* 1938 29 353

According to the author acute non suppurative thyroiditis is perhaps the rarest inflammatory condition of the thyroid gland and the least known. The thyroid gland is notoriously very resistant to infection and to inflammatory involvements mostly because of its great vascularity and high iodine content. However in the presence of goiter and especially nodular goiter this resistance toward infection tends to be decreased. According to Blanninger the cause of acute non suppurative thyroiditis may include the following factors: (1) a decreased vascularization; (2) a tendency to hematomas; (3) the appearance of degenerative changes and (4) atheromatous and sclerotic changes of the capsular vessels.

The first detailed description of the condition was given in 1904 by De Quervain. From 1904 to 1936 there have been reported altogether 54 cases in the literature. The condition is encountered especially in countries in which goiter is endemic. It affects women chiefly and is observed most frequently in adolescence and in middle life. As the age advances the incidence decreases.

Symptomatically, the onset is sudden and is characterized by the appearance of a tumefaction accompanied by considerable pain which may be spontaneous or may be elicited by the slightest pressure. Because of the pain the head is held in a characteristic position which is maintained throughout the acute phase of the disease. There are usually difficulties in deglutition and there is inspiratory stridor and hoarseness due to involvement of the recurrent laryngeal nerve. Fever may be present and in some cases clinical signs of hyperthyroidism

may supervene. Usually the course of the disease is prolonged for about ten days, after which time the subjective and objective symptoms gradually disappear.

The diagnosis is not difficult if the physician is familiar with the condition. The disease is to be differentiated from tuberculosis, syphilis and malignant neoplasm of the thyroid gland. It should also be differentiated from acute suppurative thyroiditis which is characterized by pain, muscular rigidity, fluctuation due to the presence of pus and enlargement of the cervical lymphatics. The prognosis of acute non suppurative thyroiditis is favorable. In a series of 125 patients the condition was followed by myxedema in only 2 cases. Hyperthyroidism occurs more frequently as a sequel and has been observed in about 8.8 per cent of the cases.

Therapy is strictly conservative and symptomatic. Surgical interference does not prevent recurrences.

Anatomopathologically the condition is characterized by: (1) proliferation, detachment and degeneration of the epithelial cells lining the alveoli; (2) changes and progressive disappearance of the colloid; (3) polymorphonuclear lymphocytic and macrocellular (transformed connective tissue cells?) infiltration into the alveoli and formation of giant cells around unabsorbed portions of colloid and (4) the appearance of organized connective tissue.

Little is known concerning the cause of the disease. From a statistical study of his own series of cases the author is inclined to believe that in many cases the disease is secondary to severe systemic infections such as scarlet fever, typhoid fever and acute articular rheumatism. Some cases have been reported to have followed a tooth extraction, epidemic parotitis, puerperal infections and post-operative abdominal abscess. The so-called primary forms of the disease are believed to be clinically related to rheumatic fever. Indeed Vincent believes that tenderness and swelling of the thyroid gland constitute pathognomonic signs of rheumatic fever.

Bacteriological examinations unfortunately, have not yielded any conclusive results. It is thus assumed that this process within the thyroid gland is due to the action of a toxin rather than to the action of pathogenic microorganisms present in the gland.

RICHARD C. SOMMA M.D.

"Laminectomy and partial removal of non-encapsulated lesions may offer relief from compression of the cord in a variety of neoplasms, but it is not indicated for metastatic lesions because the relief obtained is usually of too short duration before other metastatic growths appear to justify the surgical procedure."

Since October, 1935, operation has been performed at the clinic for 98 additional intraspinal tumors. Seventy-four of these were extramedullary and 20 intramedullary, in addition, 3 were tumors of the filum terminale and 1 was in the sacrum. During this same period, we have also operated on 131 patients who had ruptured intervertebral discs (27, 28, 30), with prolapse of the nucleus pulposus into the spinal canal (31). This gives us a total count of 680 verified intraspinal tumorous lesions, including the protruded intervertebral discs, but it does not include metastatic lesions of the spine.

Symptoms Tumors (16, 39, 40) which arise from the tissues surrounding the spinal cord have been designated as "extramedullary," in contrast to those which arise in the cord itself, which have been called "intramedullary." Oppenheim and Frazier have divided the symptoms of extramedullary tumors into three phases. The first phase is involvement of the nerve roots, the second, beginning compression of the spinal cord, and the third, extreme compression of the spinal cord, producing the clinical picture of transverse section of the cord.

The outstanding symptom of involvement of the nerve roots is pain which is usually characteristic and pathognomonic. It may precede any other symptoms by months or years, it may be constant or intermittent, persist in a localized region, and radiate over the involved nerves. It is usually lancinating and is aggravated by coughing, sneezing, lifting, and straining at stool, and it invariably awakens the patient from four to six hours after he has retired. It often becomes so severe as to compel the patient to walk the floor or to sleep in a sitting position. The mechanism that produces this pain apparently is the ball-valve action of the tumor, which is forced downward by the increased pressure of the cerebrospinal fluid above it, and thus produces traction directly or indirectly on the nerve roots. Unfortunately, many of these patients are treated for neuritis, muscular rheumatism, or syphilis, and some have been thought to have had hysteria. The importance of recognizing or suspecting the first, or painful, phase in the development of tumors of the spinal canal was emphasized in a recent survey by Craig (9) in which he states

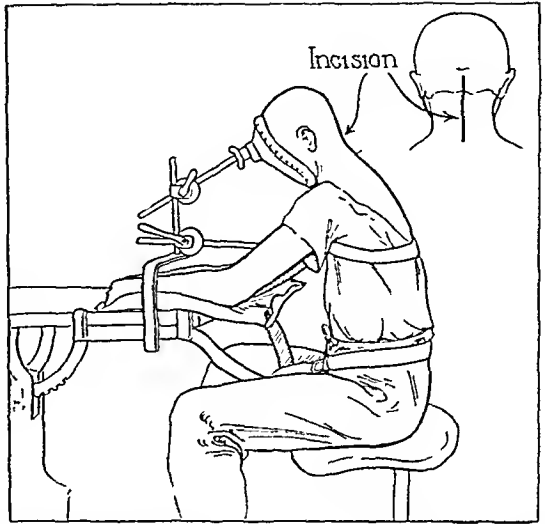


Fig 2 The upright position employed for cervical laminectomy

that 10 per cent of the patients who had root-pain had been operated on for some thoracic or abdominal lesion other than an intraspinal tumor.

When the tumors occur in the cervical region of the cord (5, 37), the pain may be localized in the neck or extend to the occiput or to the shoulders, and depends on the localization of the tumor. It is increased by laughing, sneezing, or coughing, and may be accompanied by some rigidity of the neck.

Tumors in the thoracic region produce pain which frequently simulates intercostal neuralgia, cholecystitis or cholelithiasis, renal colic, or even appendicitis.

Tumors of the cauda equina and the filum terminale in the lumbar and sacral regions give rise to pain which simulates that of sciatica (29). Again, the pain may persist for months before signs of compression are manifest. Rupture of the intervertebral disc, with prolapse of the nucleus pulposus in the lumbosacral region, according to Love and others, is also characterized by symptoms of chronic recurring sciatica. The usual neurological signs consist of a positive Lasègue sign and a diminished Achilles reflex. Intraspinal studies are necessary to verify the diagnosis.

The symptoms which develop in the second symptomatological phase, the phase of beginning compression of the spinal cord, differ from those of the first phase in that neurological evidence of compression of the cord now becomes evident.

TABLE II—DISTRIBUTION BY SITUATION OF 451 TUMORS OF THE SPINAL CORD

Position of tumor	Extradural	Intradural		Total
		Extramedullary	Intramedullary	
Cervical	19	20	19	67
Cervicothoracic	8	12	24	55
Thoracic	50	12	49	210
Thoracolumbar	10	26	5	51
Lumbar	18	22	5	55
Lumbosacral	5	6	2	13
Sacral	1	1	5	9
Total	0	219	122	451

It is doubtful if trauma is a predisposing factor unless it is responsible for the development of osteomas, fibromas, and enchondromas in the intervertebral discs. Trauma, as well as chronic infection, may be responsible for hypertrophic osteitis which produces radiculitis and slowly progressive myelitis simulating the symptoms of intraspinal tumor. In cases in which malignant tumors were present in some part of the body, metastatic malignant growths have been reported to have occurred in the spine after injuries to the back.

Pathology. In a review (19, 24, 26, 35) of 451 verified cases of intraspinal tumor in which patients were operated on at The Mayo Clinic (Table II) it will be observed that 120 of the tumors were situated extradurally, and that 219 tumors were found to be situated intradurally but extramedullary. In 112 cases the lesion arose from the structures of the spinal cord or lumbar terminale.

Further classification of the tumors, according to pathologic structure and the tissue involved was made by Kernohan and Craig (9) (Table III). Craig in his recent article on Tumors of the Spinal Cord has grouped the tumors according to the pathologic classification. His study revealed that there were 112 neurofibromas (23) (perineural fibroblastomas), 81 of which were attached to the nerve roots within the dura and 6 of which arose extradurally and extended into the canal; the remaining 5 originated in the nerve filaments as they left the cord. Craig has stated that it was not infrequent to find these tumors extending from within the dura to the extradural space or extending from the extradural to the intradural space thus producing what is commonly referred to as a dumb-bell tumor (32, 33).

TABLE III—TISSUE CHANGES THAT CAUSE COMPRESSION OF THE SPINAL CORD

Of extra-meningeal origin	Arch of vertebra	Hypertrophic osteitis Benign giant cell tumor Osteoma Chondroma
	Body of vertebra	Carcinoma metastatic Osteosarcoma Benign giant cell tumor Chondroma
	Intervertebral disc	Fibrochondroma Fibromyxochondroma Chondroma Abscess Lipoma
	Extradural fat	Lymphosarcoma Fibrosarcoma metastatic Hypernephroma metastatic Cholesteatoma
Of meningeal origin	Spinal nerves	Neurofibroma
	Blood vessels	Hemangioma Hemangio-endothelioma
	Extradural	Tuberculoma Fibroma Pachymeningitis Endothelioma (meningeal fibroblastoma)
	Intradural	Hemangioma Neurofibroma Cystic arachnoiditis Ventriculitis
Of medullary origin	Tissue of the cord	Fibroma Ependymoma Glioma Angioma Endothelioma Fibrosarcoma Hemangioma
		Cysts including syrinx Myelitis and dermoids
	In the cord but not of its tissues	Abscesses Malignant metastatic growths

Endotheliomas (meningeal fibroblastomas) numbered 219 out of the 451 tumors or approximately one half of the entire group. These tumors are non-malignant, definitely encapsulated and are easily removable. Since most of them arise from the arachnoid, become adherent and may extend into the dura, it is therefore important to remove the involved meninges in order to prevent recurrence. Many of the extradural tumors as well as the tumors arising in the lumbar terminale, are operable. Tumors within the spinal cord are rarely removable, but it is possible to decompress the cord by incising it in the midline over the tumor. Such a procedure permits partial removal of the tumor and extrusion of the tumor permits of relief of pressure on fiber tracts that are not involved.

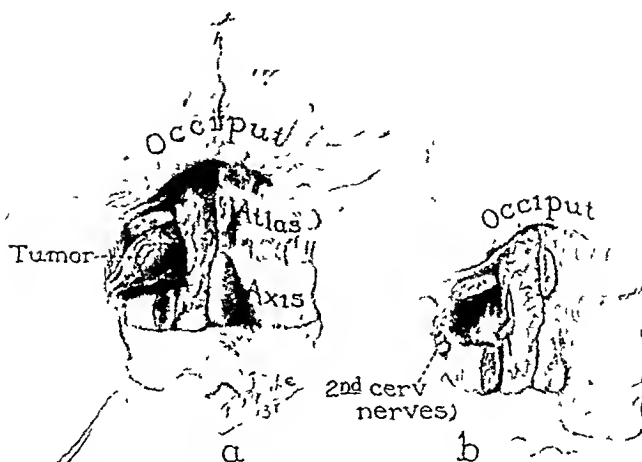


Fig. 4 Removal of tumor illustrated in Figure 3 a, Left unilateral laminectomy exposing tumor, b, surgical field following removal of tumor.

of the skin of the body is necessary for evidence of cutaneous fibromas or pigmented patches of von Recklinghausen's disease. This general view allows for comparison of the size of the two arms and the two legs, as well as for detection of muscular fibrillation and of atrophy of isolated sets of muscles.

Primary malignant growths of the abdominal and pelvic viscera should be kept in mind in examination of elderly patients, and the urine should be examined for evidence of renal tumors. Rectal palpation should be done for the detection of malignant growths of the pelvic organs, rectum, prostate gland, and for growths from the sacrum.

Neurological examination. In the case in which tumor of the spinal cord is suspected, there is no investigation so important as a complete neurological examination. The information elicited by a detailed testing of the reflexes, muscular strength, muscular tonus, sensory acuity, gait, co-ordination, and balance tends to distinguish between degenerative diseases and the syndrome of compression of the cord.

Spinal puncture. This examination is very important, because it reveals information concerning the physical and hydrodynamic properties of the spinal fluid, and allows the chemical reactions of this fluid to be determined. The puncture is usually performed at the fourth lumbar interspace, and before any fluid is removed the intraspinal pressure is estimated by means of Ayer's water manometer which normally registers between 12 and 15 cm. As soon as the pressure has

been estimated, Queckenstedt's test is made, which consists of reading and studying the rate of rise of the cerebrospinal fluid in the manometer following compression of both internal jugular veins. Sudden rise and rapid fall of the fluid on compression of both internal jugular veins, in-

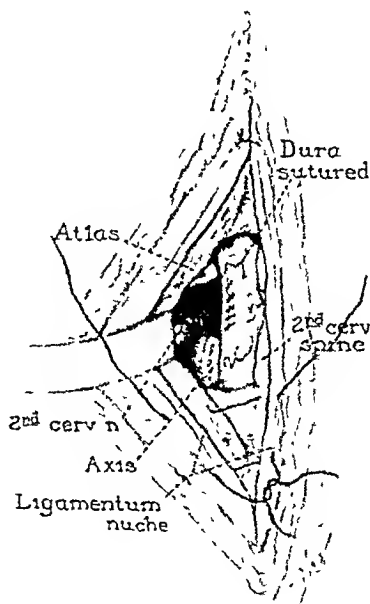


Fig. 5 Closure of dura and musculocutaneous wound

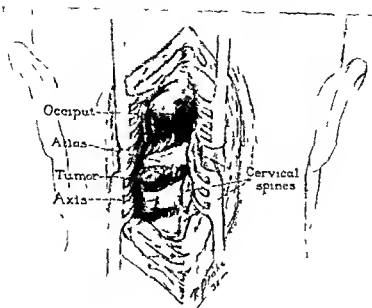


Fig 3 Exposure of a dumb-bell neurofibroma by unilateral laminectomy

The symptoms may develop simultaneously with the existence of pain, or they may develop without the presence of pain in a small percentage of cases. If the tumor is situated anterolaterally, the symptoms will progress and produce the Brown Séquard syndrome—a homolateral paralysis of the muscles below the level of the lesion with impairment of tactile and deep sensibilities on the same side together with loss of, or diminution of, the sensation of pain and temperature on the opposite side. If the posterior columns of the cord are the first to be compressed by tumor, the deep sensibility is decreased and ataxia appears. Sensory disturbances resulting from compression of the cord are gradual in onset and progress upward to a transverse level corresponding to the segment of the cord that is compressed.

At the lower end of the spinal cord other difficulties may be encountered. The relative shortening of the cord incident to growth and the emergence of the roots through the anterior foramina of the sacrum often make it extremely difficult to determine whether there is a tumor of the conus medullaris, of the cauda equina, or of the sacrum. The objective findings may be the same. In this group studies with lipiodol are found to be valuable in the localization and differentiation of the lesion.

Paralysis below the level of the tumor comprises the third symptomatological phase, and is caused by extreme compression of the cord. The paralysis is usually complete; sensory functions are entirely lost, trophic disturbances are present, and there is definite loss of control of both vesical and rectal sphincters.

Intramedullary tumors. These rarely produce pain, and pass directly into the second symptomatological phase. The sensory and motor disturbances are progressive until a definite transverse level becomes evident. The upper sensory level is less distinct than that produced by extramedullary tumors. Increased reflexes and loss of vesical and rectal control appear early in the symptom complex.

Examination. The symptoms which play important parts in the diagnosis of intraspinal lesions emphasize the necessity of a comprehensive history in all cases. Following the taking and recording of the history, a detailed general, as well as a neurological examination is necessary. These examinations should include such special features as spinal puncture, Queckenstedt studies and roentgenograms of the spinal column with or without the introduction of iodized oil.

General examination. In all cases in which intraspinal lesions are suspected, close inspection

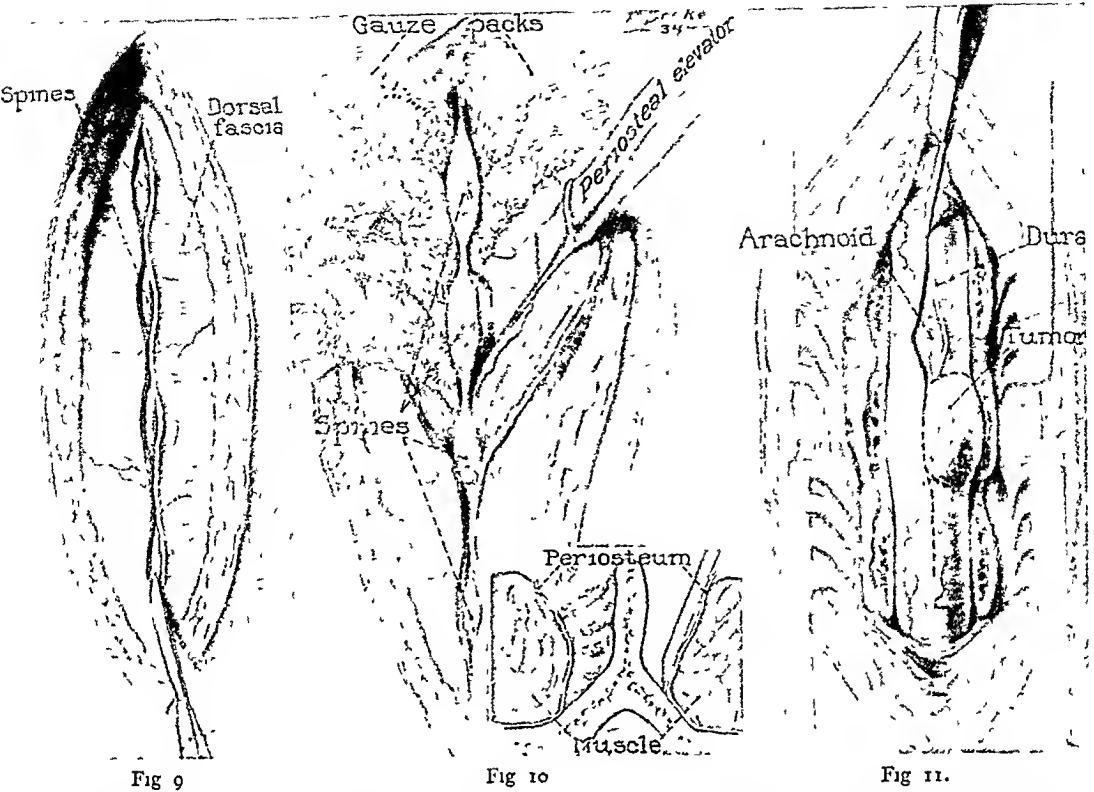


Fig 9

Fig 10

Fig 11.

Fig 9 Incision of skin and fascia exposing the spinous processes as the first step of laminectomy

Fig 10 Control of hemostasis by subperiosteal elevation of the erector spinae muscles

Fig 11 The extent of the laminectomy in order properly to expose the subdural but extramedullary meningioma

by the tumor, destruction caused by benign or malignant tumor of the bone, metastatic disease, and hyperostosis. Camp, in a review of cases in which operation was performed between January 1, 1931, and September 1, 1933, reported that osseous changes which directly localized the lesion were observed roentgenographically in 50 per cent of the cases. The percentage of cases in which osseous changes were detected varied considerably with the different types of tumors (neurofibromas, 65 per cent, endotheliomas, 11 per cent, ependymal-cell gliomas or caudal tumors, 66 per cent, hemangiomas and hemangio-endotheliomas, 33 per cent; intramedullary tumors exclusive of ependymal-cell gliomas, none).

"Camp divided tumors of the spinal cord into three groups, considered roentgenologically. The first, and fortunately the predominating group, were benign tumors arising from soft tissues within the spinal canal. The most common tumors of this group included neurofibromas, endothe-

liomas (meningiomas), hemangiomas, angiomas, lipomas, and dermoid cysts. Ependymal cell gliomas (ependymomas) were included in this first group because roentgenologically they resemble benign tumors. Among the common tumors named there are no individual distinguishing roentgenologic characteristics, except those possessed by the neurofibromas, which have a tendency to extrude through an intervertebral foramen, producing a dumb-bell or hour-glass tumor, partly within and partly without the spinal canal. Bony changes rarely occur in the absence of partial or complete block of the spinal canal, unless the tumor is held in contact with the bone by nerve roots or meningeal attachments. One pedicle of the vertebra at the level of the tumor usually exhibits, or both pedicles may exhibit, evidence of erosion before it can be discerned in the lamina or body. The pedicle is first flattened and, as the tumor grows, the surface becomes concave and eventually destroyed.

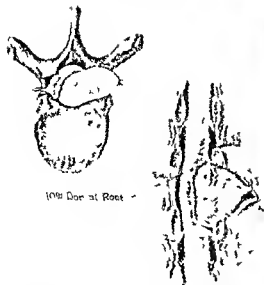


Fig 6 Compression of the cord by a neurofibroma with erosion of the vertebra and ribs

dicates free flow of the cerebrospinal fluid within the subarachnoid space. Slow rise and fall of the fluid or its failure to rise on compression of the jugular veins, suggest partial or complete intraspinal block.

Elsberg and Hare have suggested a modification of the test for subarachnoid block in cases in which tumor of the spinal cord is suspected. When the spinal puncture needle and manometer are in place, they suggest inhalation of amyl nitrite, instead of compression of the jugular veins to create increased intracranial pressure. They stated that the rise in the manometer gives more information than the usual Quackenstedt test. Elsberg wrote that in 13 of 63 cases in which tumors of the spinal cord were suspected and in which this test was applied subarachnoid block was demonstrated. This test is believed to be much more delicate than the usual manometric tests for subarachnoid block.

Inability to obtain fluid at the fourth lumbar interspace may signify that the tip of the needle has failed to enter the subarachnoid space, that fluid is absent or that there is a tumor at this level. Puncture should be made at another level and it may be necessary to make multiple punctures. Occasionally, it is necessary to combine cisternal puncture with lumbar puncture.

Spinal block (6, 8) if it results from tumor frequently causes an increase in the concentration of globulin in the cerebrospinal fluid below



Fig 7

Fig 7 A neurofibroma which had undergone cystic degeneration

Fig 8

Fig 8 A cervical cranial dumb bell neurofibroma

the tumor. The fluid may also be xanthochromic (14) (Froiss syndrome) (21). The shade of yellow may vary, and occasionally the fluid above a block is decidedly yellow. The cell count is usually normal, but pleocytosis may occur if the tumor is situated in the spinal canal below the conus medullaris, and this may help in the distinction between tumors and inflammatory lesions.

The presence of partial or total block is not pathognomonic of intraspinal tumor, since previous attacks of meningitis, acute myelitis, injuries to the vertebrae or spinal deformities are all capable of interfering with the free flow of the cerebrospinal fluid. However, it is apparent that the finding of partial or total block is extremely valuable in diagnosis when the block is accompanied by a history of root pain, with a negative history of inflammation or trauma of the spinal cord.

Röntgenographic examination. Roentgenograms (22) should be made of anteroposterior and lateral aspects of the vertebral column (7, 8). These should be supplemented by stereoscopic and oblique views localized at the level where on clinical grounds, the tumor has been suspected to be. According to Camp and me (8) evidence of erosion of the vertebral pedicles, laminae, and lateral and spinous processes caused by pressure usually is discernible before erosion is evident in the body of the vertebra. In general roentgenological evidence of changes resulting from tumors of the spinal cord consists of shadows indicative of erosion secondary to direct pressure invasion

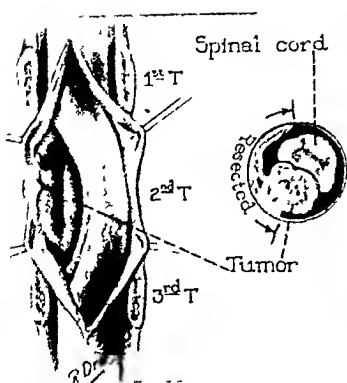


Fig 14

Fig 14 The scissile character of an occasional meningioma

Fig 15 The degree of compression of the spinal cord that can result from a meningioma

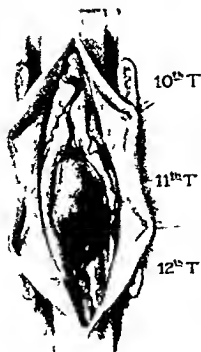


Fig 15

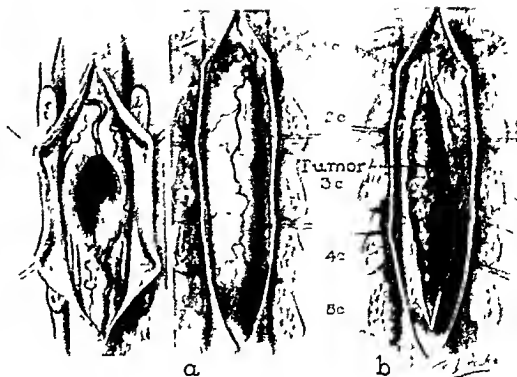


Fig 16

Fig 16 a and b, An intramedullary spinal-cord tumor which presents a fusiform thickening of the cord with partial extrusion of the tumor when the cord has been incised

arachnoid space Fluoroscopic examination of the slowly moving oil is superior to examination of a roentgenogram, since the roentgenologist often sees the diversion of the current of oil around the tumor. However, roentgenograms should be made for confirmation of the levels where tumors are suspected to be Intramedullary tumors are identified by division of the oil into two currents, one on each side of the cord. Use of the heavier oils avoids its ascent into the cisterns and ventricles Because introduction of these oils invariably produces irritation of the meninges, and occasionally radiculitis, they should be used only to localize tumors definitely After the oil has been injected, the patient should be placed prone on the fluoroscopic table, and the flow of oil should be observed when he is in various positions, from horizontal to perpendicular Experience with the use of radiopaque oil in the diagnosis of tumor of the spinal cord has indicated that oil should be used infrequently, only when tumors are suspected, and that the oil should be removed at operation whenever possible The presence of extramedullary tumors usually is indicated by definite arrest of the flow of lipiodol If there is no tumor or compression of the cord, the oil descends and remains permanently in the sacral cul-de-sac "

Differential diagnosis The symptoms of metastatic lesions may be the same as those of any benign tumor of the spinal cord, except that the progress of malignant growth is usually more rapid. Metastatic growths from carcinomas of the breast or prostate gland are most frequent It must not be forgotten that a primary carcinoma of the breast may have been removed many

years before metastasis gives evidence of its presence Since carcinoma of the prostate gland may not produce local symptoms, rectal examination should be made as a routine procedure

Among the various diseases that may be difficult to distinguish from tumor is hypertrophic pachymeningitis In this disease, the dura becomes thickened, usually in the cervical region This thickening pinches off the nerve roots, and causes pain, atrophy, and sensory disturbances of the arms and hands, by compressing the cord it causes impairment of function below the lesion

The condition, meningomyelitis, may remain localized There is often a history of antecedent trauma or infection. As a rule, examination does not disclose a Brown-Séquard syndrome, the upper level of anesthesia is usually indistinct, and all qualities of sensation are equally affected, possibly because the inflammation penetrates the cord

The spinal column itself may be the seat of the original disturbance Compression of the cord is not uncommon in Pott's disease A somewhat infrequent cause of compression is chronic hypertrophic osteo-arthritis of the spinal column, of which the roentgenogram often fails to give evidence Spondylolisthesis, or a slipping forward, usually of the fifth lumbar vertebra on the sacrum, often results in injury to the cauda equina. Occasionally, a case of Paget's disease is encountered in which the cord shows evidence of compression A tumor may be superimposed on spina bifida The difficulty lies in the fact that the symptoms of spina bifida occulta may be late in appearing, presumably on account of traction on the cord and nerve roots which are anchored



Fig 12

Fig 13

Fig 12 Removal of meningioma with attached meninges
Fig 13 Lipiodol study localizing the tumor illustrated in Figure 12

The second group of tumors classified roentgenologically consists of malignant tumors arising from soft tissues within the spinal canal. Tumors of this group include both primary and metastatic lesions. The intramedullary tumors, particularly the gliomas with the exception of ependymal cell gliomas, which were considered in the preceding group, do not commonly involve the vertebrae secondarily. Sarcomas, lymphosarcomas, malignant hemangioendotheliomas and metastatic growths destroy the surrounding vertebrae by direct infiltration and thereby produce a well recognized roentgenologic picture of malignant disease in bone. Extension into the paravertebral tissues is not uncommon. Rarely from the secondary changes in the bone, can the primary or metastatic nature of the tumors of soft tissues be predicted except as similar changes may be observed in other regions of the spinal column.

A third group of growths according to Camp's (17) classification arise from the intervertebral discs and involve the spinal canal; these are tumor-like protrusions.

Growths in this group are most common in the lumbar portion of the spinal column and consist usually of two types. One of the types includes chondromas, fibrochondromas and fibromyxochondromas; the other type includes traumatic prolapse of intervertebral discs into the spinal canal. Because of their cartilaginous nature these masses themselves are not visible in roentgenograms. However, the posterior portion of the intervertebral space may be narrowed and the contiguous bone may be eroded.

"The benign tumors of the vertebrae include osteomas, osteochondromas, chondromas, fibrochondromas, giant cell tumors, and hemangiomas. All of these tumors, which may involve the spinal cord by compression, have the same roentgenologic effects on the vertebrae as they have on other portions of the skeleton. Giant cell tumors usually involve the bodies of the vertebrae although the bony processes are not uncommonly affected. This multilocular cystic lesion, primarily in the vertebrae, should be readily distinguished from localized erosion caused by a benign tumor of the spinal cord. Collapse of a vertebra produced irregular absorption and thickening of the trabeculae of the bone, giving its structure a coarse, honeycombed appearance.

"The tumors of the vertebrae that are malignant and that secondarily involve the spinal cord, consist of sarcomas, myelomas, endotheliomas, metastatic carcinomas and hypernephromas. The chondromas are included in this group since they arise from remnants of the notochord that remain in the vertebrae or sacrum, and for roentgenologic consideration are essentially tumors of bone. They most commonly arise in segments of the sacrum, where they produce extensive malignant destruction and even invade the ilium and pelvic cavity. They are closely imitated by metastatic and malignant growths and commonly are confounded with large lumbosacral ependymal cell gliomas. However, ependymal cell gliomas should be readily distinguished from malignant tumors of the vertebrae, because the secondary destruction of bone which accompanies the former is different from the primary destruction which accompanies the latter.

Primary infectious conditions of the vertebrae such as tuberculosis, osteomyelitis, actinomycosis and coccaloid granuloma may result in an intraspinal abscess and the destroyed portions of the vertebrae together with involvement of one intervertebral disc or more than one, should suggest the presence of an infectious process since the structures named are partially resistant to the invasion by tumor.

Study with radiopaque oil. In addition to the roentgenologic evidence of tumors which is apparent in routine examination of the spinal column, fluoroscopic and roentgenographic study by the use of radiopaque oil has furnished much additional information in diagnosis and localization of intraspinal tumors. Injection of 5 c.c. of iodized oil into the subarachnoid space either through cisternal puncture or lumbar puncture allows visualization under the fluoroscope of the patency, or of the lack of patency of the sub-

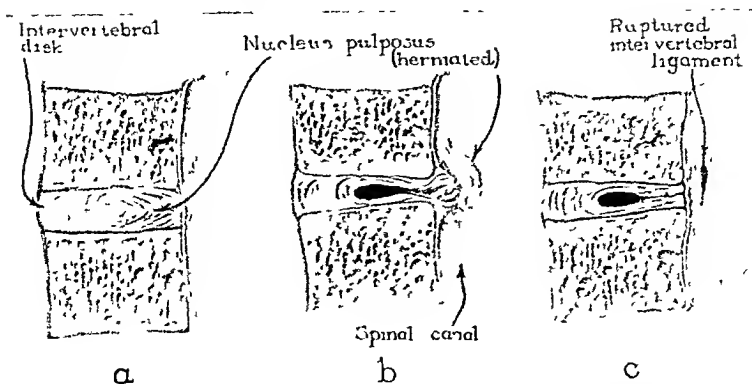


Fig. 21 The mechanics involved in the rupture of the intervertebral disc with prolapse of the nucleus pulposus. *a*, A normal intervertebral disc, *b*, prolapse of the nucleus pulposus into the spinal canal, *c*, appearance of the ruptured intervertebral disc following removal of the prolapsed nucleus pulposus.

nences in the wound, which invariably become tender if exposed to pressure. Unilateral laminectomy has some advantages in the cervical vertebrae in the prevention of slipping of one vertebra on the other.

In removing the laminae over a tumor, one should always be careful to avoid additional pressure on the cord and always avoid accidental trauma or interference with the circulation by sponging the dissection. If the tumor is situated anterolaterally or anteriorly it is much wiser to split it and remove it piecemeal rather than to force it out at the risk of injuring the cord. Intramedullary tumors, such as hemangio-endotheliomas, ependymomas, and astrocytomas, may be partially or totally removed through a longitudinal incision of the cord. Caution again is advocated to prevent additional trauma or

interference with the circulation during dissection. In closing the wound it is well to suture the dura, except in intramedullary lesions when further growths of irremovable tumors are expected. Defects in the dura can be protected by animal membrane to prevent the entrance of blood into the subarachnoid or subdural spaces. The muscles are closed by interrupted sutures, as are the fascial planes, the subdermal, and skin layers. Drainage is rarely necessary, but if it becomes necessary gauze packs may be employed, but they should be so placed as to prevent pressure on the cord and should be removed in forty-eight hours to prevent cerebrospinal fistulas (Figs. 2 to 24, inserted as a block of illustrations to illustrate groups in sequence).

Postoperative care. Following the operation the patient is placed in bed in the lateral position on

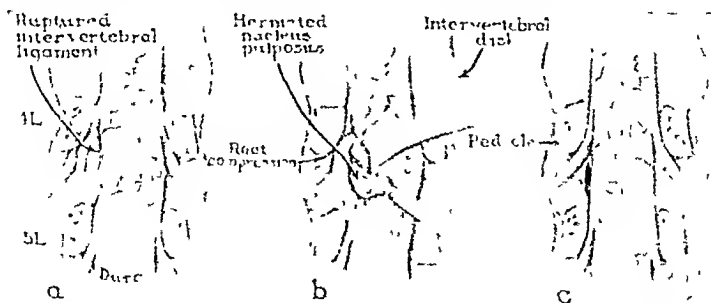


Fig. 22 The compression of the nerve root by the protrusion of the nucleus pulposus into the spinal canal and the relief of compression when the mass has been removed. *a*, Protrusion of the nucleus pulposus through a rent in the intervertebral ligament, compressing the lumbar nerve root, *b*, removal of the ribbon fibrocartilaginous nucleus pulposus, *c*, relief of compression of the nerve and dura following removal of the fibrocartilaginous mass.



Fig 17

Fig 17 Partial removal of an intramedullary spinal cord lipoma which resulted in amelioration of symptoms and permitted the patient to return to his occupation of clothing clerk for seven years

Fig 18 A circumscribed ependymoma arising from the filum terminale

below Spindle legs, deformity of the feet an area of sacral hypertrichosis, and a sacral dimple are useful signs

In cases of subacute combined degeneration of the spinal cord, the lesion although progressive, is usually painless and diffuse

The diagnosis of tabes dorsalis is sometimes erroneously made when the real cause of the symptoms is a tumor of the spinal cord or cauda equina

It may be difficult to distinguish syringomyelia from intramedullary tumor (25) However in the presence of the former the following usually aid in establishing the correct diagnosis the characteristic waistcoat type of sensory disturbance, with a predilection for involvement of pain and temperature fibers since these lie near the central canal and the local atrophy caused by extension of the process here and there into the anterior horns If a tumor of the cord is associated with syringomyelia the diagnostic difficulties may be insurmountable

Although multiple sclerosis may produce a transverse lesion of the cord the youth of the patient, the absence of pain and the presence of cerebral signs such as tremor, scanning speech, nystagmus, optic atrophy, ocular palsy, and the characteristic emotional lability, usually put the diagnostician on guard

Operative technique The operative technique (15, 20, 36) has become fairly well standardized and consists of laminectomy which includes the removal of three or four spinous processes and laminae in order to facilitate the removal of the tumor, it permits the surgeon to approach the

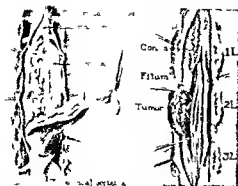


Fig 18

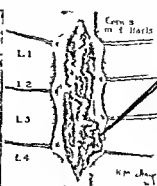


Fig 19

Fig 19 An arteriovenous fistula of the vessels supplying the conus medullaris and the cauda equina

Fig 20 The appearance of an extradural hemangioendothelioma and the compression of the cord that it had produced

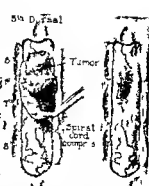


Fig 20

tumor from above or below A special type of anesthetic is not required, the induction of ether through an intratracheal Magill tube perhaps is most serviceable A paravertebral regional anesthetic with pre operative use of morphine and scopolamine decreases the amount of bleeding but cannot be used satisfactorily for hypersensitive or nervous patients Nitrous oxide and ethylene are unsatisfactory since they both increase the venous bleeding during operation Tribromethyl alcohol by rectal administration is a popular anesthetic at present and has the advantage of not aggravating chronic pulmonary lesions but there is a disadvantage in the occasional idiosyncrasy to the drug

In outlining the field for operation the surgeon must bear in mind the neurological segment involved and the fact that it is placed at a higher level than the vertebra itself On exposure of the dura cerebrospinal pulsations indicate that the exposure is above the tumor whereas the absence of cerebrospinal pulsations indicates that the exposure is below the tumor

The bleeding should always be controlled and this is most effectively done by subperiosteal elevation of the periosteum of the spinous processes and the laminae in conjunction with the erector spinae muscles rather than by incision of the muscle attachment lateral to the spinous processes In removing the laminae it is well to carry the resection wide to each side to prevent subsequent compressions of the cord by calluses that may develop Prominent spinous processes above or below the laminectomy should be resected in order to prevent any undue promi-

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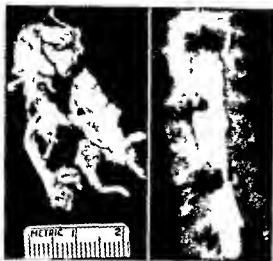


Fig 23

Fig 24

Fig 23 A typical specimen of a prolapsed nucleus pulposus removed at operation

Fig 24 A bispodol study revealing two intraspinal protrusions of the nucleus pulposus

pillows to prevent undue pressure on the tips of the shoulders and hips. It is preferable to turn the patient from side to side and on the abdomen rather than to allow him to lie on his back as sweating may result in maceration of the skin and contamination of the wound and interfere with primary union. The patient otherwise is treated as is the average surgical patient. If urinary incontinence is present it is safer and the danger of cystitis is decreased if an indwelling catheter rather than repeated daily catheterization is used. This catheter should be changed every four or five days and the bladder should be irrigated twice daily with an antiseptic solution. A urinary antiseptic in the form of sodium acid phosphate and methenamine is administered as a precaution against ascending pyelonephritis. Usually daily doses of mineral oil with milk of magnesia are administered to prevent distention from fecal impaction. In addition a daily enema is necessary. The patient is usually kept in bed for two weeks when he is permitted to sit in the up right position in bed and subsequently allowed to be taken about in a wheel chair and to walk if possible. The usual postoperative course continues for three weeks. Physiotherapy is advised if muscular cramps and motor weakness exist. Indwelling catheters should be permanently removed when the patient has recovered sufficient control of the bladder to enable him to empty it thoroughly.

Contractures and defense reflex spasms are corrected and relieved during the period of convalescence by the application of Buck's extension to the feet and legs in the reclining position. The recovery of motor sensory, vesical rectal and sexual functions takes place in the reverse order of their previous disappearance.

SUMMARY

The surgical mortality for this group is 4 per cent. The time for recovery of motor and sensory losses depends on the character of the tumor and the degree and duration of the paralysis. Primary malignant and metastatic growths of the spine are rarely operable and therefore are not included in the study of intraspinal tumors. Hard rounded tumors cause greater injury to the cord and more paralysis than the soft, elongated tumors. A 25 per-cent loss of function is usually recovered within three months, a 50-per-cent loss requires from six to twelve months, a 75 per-cent loss requires up to eighteen months and a total loss requires up to two years unless the injury to the cord has been so extensive that recovery will never take place. The removal of intramedullary infiltrating tumors often results in temporary improvement which may continue from six months to seven years but rarely is recovery to any degree comparable to that following removal of extradural and subdural but extramedullary tumors.

It is apparent that the approach to completeness of recovery depends directly on the duration and extent of injury produced by the neoplasm so long as the blood supply to the cord has not been destroyed by the tumor. Recovery can be anticipated even in cases of extensive paralysis since compression produced by the tumor results first in destruction of the gray substance of the cord second in compression atrophy of the myelin and lastly in destruction of the axons. However if at any time the dorsal or ventral arteries become compressed or thrombosed the damage from the resulting paralysis remains permanent. This undoubtedly explains the difference in the degree of recovery following partial or complete paralysis attributable to intraspinal tumor and to injuries for in the former instance the circulation of the cord is usually maintained whereas in the latter instance the circulation is found to be destroyed.

Eighty five per cent of intraspinal tumors are benign and are operable. The differential tests make it possible to operate earlier on the patient and to obtain more rapid and more nearly complete results.

turcica, and invaded the brain stem at the junction on the peduncles and pons. This type of tumor, arising as it does from notochordal remnants, has been reported only 71 times previously. The tumor was composed mainly of "cords, masses, and concentric nests of cells embedded in a fairly abundant homogeneous or stringy mucoid matrix." No mitoses were found. Characteristic of this tumor were many fine cellular fibrils which stained like fibroglia, their presence being shown most advantageously by a phosphotungstic acid hematoxylin. This feature has been described only once before, probably because formalin fixation and hematoxylin-eosin stain, most commonly used, will not demonstrate the presence of such fibrils.

JOHN MARTIN, M D

Riehle, R : A Clinical Study of the So-Called Delayed Paralysis of the Facial Nerve (Zur Klinik der sogenannten verspäteten Facialislähmung) Freiburg Dissertation, 1937

The facial nerve, because of its anatomical course, is particularly endangered in cases of fracture involving the base of the skull, however, in fully half the cases the paralysis is late in appearing. In a collective study of the period from 1929 to 1935 there were 393 skull fractures in men. Ninety-six were basal and 15 presented paralysis of the facial nerve. The paralysis occurred immediately after the fracture in 7, and after a few days in 8. Of 69 skull fractures in women, 15 involved the base and there was only 1 case with delayed facial paralysis. In immediately fatal craniobasal fractures, paralysis of the facial nerve is frequently present, without, however, receiving further notice. Roentgenologically, basal fracture was found in only 10 of the 15 cases of facial paralysis, therefore the symptom was present in 10 per cent of all of the 96 cases of fracture of the base of the skull.

From an extensive compilation from the literature, it was observed that involvement of the facial nerve is on the whole higher than 10 per cent, up to as high as 32 per cent, delayed cases are recorded only occasionally, usually after from four to seven days. The author gives detailed data on his own 7 cases.

The site of the fracture or of the pressure can be located with fair accuracy by means of Bing's schema, frequently better, in fact, than from the roentgenogram. Return of the response to electric stimulation keeps pace with the recovery from the paralytic symptoms, while the sense of taste and the secretion of tears return to normal sooner than the paralysis. Stretching, injury, pressure from hemorrhage, and swelling in the narrow facial canal bring on facial paralysis immediately or after a delay, and later permit its disappearance, but when the nerve has been torn the paralysis is permanent. In all of the cases of delayed facial paralysis in Freiburg 1 Br the course was very good, treatment was given with the galvanic, faradic, or intermittent current. (EGGLRT) JOHN W BRENNAN, M D

SPINAL CORD AND ITS COVERINGS

Loman, J.: Human Craniovertebral Dynamics. *Am J. Surg.*, 1938, 39 479

Under many different adverse conditions the cerebral circulation is able to maintain a remarkable resiliency and the ability to keep intracranial pressure at a more or less constant level. Although the skull itself is a rigid box, its contents are in no sense submitted to the inconveniences of such a container, for the foramen magnum, the craniovertebral system of veins, the cerebrospinal-fluid flow, the many other veins flowing from the intracranial contents, and the adaptability of the arterial bed all act concertedly to allow the wide fluctuations in intracranial pressure which necessity may require.

The activity of the cerebrospinal fluid is dependent upon a stable production and absorption mechanism and the adaptability of the intracraniospinal veins to pressure shifts. Physiological variations in the pressure of the cerebrospinal fluid depend upon the venous pressure, with which the cerebrospinal-fluid pressure varies directly, and upon changes in the caliber of the cerebral vessels. A third factor, that of changes of osmotic pressure, seldom affects the normal cerebrospinal-fluid pressure, though in certain pathological states which require hypertonic sucrose, this may be of the greatest importance.

Loman points out that since the pressure of the cerebrospinal fluid is a direct index of the venous pressure upon which it is dependent, great and sudden alteration in the arterial pressure must occur before the arterial side of the tree affects the cerebrospinal-fluid pressure, and therefore changes in the pressure of the latter will not alter the arterial pressure. In his experience the drainage of large amounts of cerebrospinal fluid has no effect on the carotid pressure and therefore probably not on the cerebral arterial pressure. He believes that therapeutic lumbar puncture in cases of craniocerebral injury is not attended by the danger of bleeding or increasing intracranial bleeding. He believes that such a reduction as, for instance, 50 mm of water pressure in the cerebrospinal fluid can have little effect on an artery carrying a pressure of from 1,000 to 1,500 mm of water.

The discussion of the effects of drugs and anesthetics on intracranial pressure is a practical and informative one. The article contains an excellent bibliography.

JOHN MARTIN, M D

PERIPHERAL NERVES

Gatta, R : Lateroterminal Anastomosis of Peripheral Nerves (Sulla anastomosi latero-terminale dei tronchi nervosi) *Arch ital di chir.*, 1938, 48, 155

A motor nucleus can extend its innervation to fields outside of its original destination, as in the case when the facial and hypoglossal nerves are anastomosed. Termi's experiences have shown that spinal cord nuclei easily adapt themselves to inner-

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Jupe M H The Reaction of the Bones of the Skull to Intracranial Lesions *Brit J Radiol* 1938 11 146

When bone lesions are viewed by means of roentgen rays, the bone shows pathological change in one of two ways there may be an excess of new bone being laid down as in predominating osteoblastic activity or the absorption rate may exceed that of apposition as in predominating osteoclastic activity. When an intracranial lesion is present it has been found that the bones of the skull may show either of these types of activity with either a general or local reaction.

Jupe states "General reaction is secondary to a rise of intracranial pressure and can be explained almost entirely by pressure atrophy." Convolutional marking so common in the child must be viewed with suspicion in the adult. Thinning of the inner table, changes in the vascular channels and increase in the size of the foramina for the emissary veins are other reliable signs of increased intracranial pressure. The sella turcica may show changes either posterior or anterior at the clinoids or there may be pressure changes in the floor but the author warns of the pitfalls in interpreting too closely the changes which the x rays may reveal in the sella. According to him it is a notoriously deceptive place of change. He believes that change in the sella means primarily not an intrasellar lesion but simply an intracranial lesion. Ballooning of the sella may occur even when the lesion is not actually in the sella but follows, possibly, a remotely placed

tumor (Fig 1). The author discredits Kopylov's theory that inspection of the dorsum sellae will indicate whether the lesion is supratentorial or infratentorial. He makes the interesting observation that the dorsum may regenerate following the removal of the cause of the increased pressure, provided that the dura and the perosteum which cover it have remained intact and unchanged by the pressure (Fig 2).

Local reaction in the skull bones due to an underlying tumor, is a simpler, more easily understood process. The changes are easily recognized and well known to roentgenologists and neurological surgeons alike. They are (1) thinning of the bone over an old slow growing astrocytoma (2) bulging and thinning over a tumor in a child (Fig 3) and (3) an increase in density and vascularity of the bone and frequently, hyperostoses and spicule formation at the site of a meningioma. In differentiating osteoma of the skull the author points out that carcinoma osteoma usually arises in young people that the new bone is laid down parallel to the surface of the skull and not at right angles as may be the case in hyperostoses that the original outline of the bone is lost which is not true in the hyperostosis of meningiomas and that osteoma of the skull should not alter the intracranial pressure or the protein content of the cerebrospinal fluid.

JOHN MARTON M D

Peers J H Sphenoid Occipital Chordoma *Am J Cancer* 1938 32 221

In this brief account Peers has reported the case of a sphenoid-occipital chordoma in a woman of thirty-five years the tumor having a lesion from the region of the clivus without encroachment upon the sella.



Fig 1

Fig 1 Large calcified oligodendroglioma of frontal lobe causing enlargement of pituitary fossa with thinning of dorsum sellae and increased convolutional markings.



Fig 2

showing the dorsum sellae returned to normal. Fig 3 Thinning and bulging in temporal region due to an astrocytoma in a young boy. The ventricular system is displaced to the contralateral side.



Fig 3

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Glass, G.: A Case of Tuberculoma of the Trachea. *J Laryngol & Otol*, 1938, 53 188.

The author reports in some detail a case of tuberculoma of the trachea in a male seventy-two years of age. X-ray examination revealed involvement of

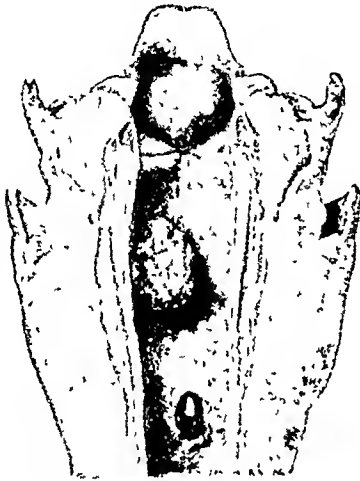


Fig 1

the lungs and a mass in the trachea. Autopsy revealed a pedunculated tumor arising by a fine pedicle from the left side of the trachea about two centimeters below the vocal cords.

JAMES C. BRASWELL, M.D.

Tiegel, M.: Concerning Valvular Drainage in Injuries of the Thorax, Particularly in Chest Gunshot Wounds (*Ueber Ventilartige bei Thoraxverletzungen, insbesondere bei Brustschüssen*). *Zentralbl f. Chir.*, 1937, p. 2775.

Valvular drainage which completely excludes the air is extremely serviceable (1) in pneumothorax under tension, following the tearing of lung tissue due to a dull force, a cut, stab, or gunshot, (2) in the presence of exudate with symptoms of compression, and (3) in cases of open pneumothorax. Tiegel, as early as 1912, had already called attention to this type of drainage, and had described a valve-like plate which permitted the exit of air, blood, and exudate from the chest cavity, and at the same time prevented the sucking in of air, however, by means of a thin rubber plate. He regrets the fact that this apparatus was not used during the World War. He has improved it and uses it together with a valve-bearing trocar, constructed in a similar manner.

He then presents a discussion of the various types of chest injuries which occurred during the World War. The mortality of open wounds amounted to 90 per cent at the beginning of the War, and then, as the result of the improved surgical measures and high pressure apparatus, it went down to 32.2 per cent (according to the combined statistics of Johns). The immediate closure of an open pneumothorax was soon recognized as a vital procedure. However, according to the statistics of Laewen, in addition to the 20 per cent mortality which occurred after operation, another 20 per cent occurred later due to empyema and tension pneumothorax, 14 of the latter 20 per cent was due to tension pneumothorax. The ideal procedure, therefore, is the exact examination of the pleural cavity and the lung, the proper treatment of these wounds and, following this, a careful suturing of the skin. This procedure is possible only during the first twelve hours and in those cases in which the patient can remain at the same field station (Goetze). In cases which come for treatment later, in which there is serious contamination of the wounds, or in which it is impossible to operate, tamponade of the chest wound, as Sauerbruch has recommended, is indicated (Franz).

In the latter type of cases Tiegel recommends the employment of his valve drainage plate which is from 10 to 18 cm in diameter, immediately closes the chest wall, and brings about the normal pressure relationships. This makes possible the expansion of the lung and on the other hand provides for the exudate drainage. In those instances in which exact surgical procedure can be instituted in the cases of open pneumothorax, the trocar valve plate should nevertheless be introduced into the line of suture at the level of the third rib posteriorly in the line of the scapula in order to provide for better drainage, and to prevent the development of hemothorax and tension pneumothorax. This latter piece of apparatus is constructed in a manner similar to the one referred to, only that it is of smaller dimension, from 7 to 14 cm, and has an accompanying stylet so that it becomes unnecessary to perform a thoracotomy. This trocar comes into question when the chest wall is closed, in those cases in which there is a small, simple wound of entrance and exit without open pneumothorax and without palpable splintering of the chest wall and precarious general condition, in which one should, according to Franz, operate only when the surgical requirements are completely filled and in which a high-pressure apparatus is available.

On the one hand the absence of these required conditions at the front lines, and the precarious general condition of the patient on the other hand, often do not permit the performance of a major operation, and in these instances it is possible to produce amelioration by means of this trocar and to provide an avenue of exit for collected blood or

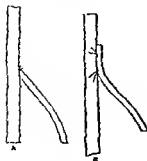


Fig. 1

vate new territories and that this extra territorial innervation is accompanied by a hypertrophy of the ganglion cell. It is also quite well established that regeneration of nerves is accompanied by a numerical increase of the regenerated fibers. Gujon has estimated that this increase is from one fifth to one third of the original number of fibers.

The author performed three series of experiments on rabbits.

In the first the proximal end of the severed peroneal nerve was imbedded in the side of the tibial nerve (Fig. 1a) and secured by one fine silk suture.

In the second a superficial longitudinal incision piercing only the perineurium was made on the tibial nerve. The proximal end of the peroneal nerve was scarified for 3 or 4 mm. and anastomosed to the tibial by two fine silk sutures (Fig. 1b). Severing of the fibers of the tibial nerve was unnecessary as the simple application of the sutures accomplished this as shown by Ballance and Bailey.

In the third series of experiments the latero-lateral anastomosis was used but it was performed a month after the peroneal nerves had been cut instead of immediately as in the first two groups.

In the three groups the microscopical examination of the nerves showed that on the twentieth day postoperative regeneration into the peroneal nerve was well started, and that by the forty-fifth day the process was in its final stages. Function of the peroneal nerve was restored although with the time limits of the experiments some atrophy of the muscles was still present. The interval between the original section of the peroneal nerve and its anastomosis to the tibial had apparently no effect on the rate of regeneration. Of the two methods of anastomosis the author prefers the latero-lateral type as it gives slightly more satisfactory results than the latero-terminal anastomosis.

DAVID INFANTATO, M.D.

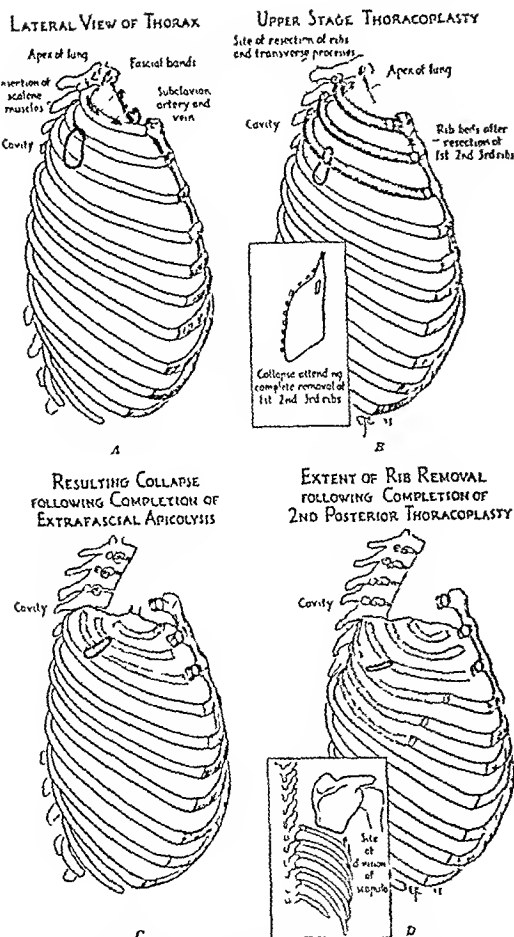


Fig 2 Diagrammatic sketches of lateral view of thorax to show effects of thoracoplasty and apicectomy on the lung
 A, Before operation Note attachment of fascial bands
 B, After upper-stage thoracoplasty there is collapse of the upper portion of the lung without descent of the apex.
 C, After extrafascial apicectomy the apex has been immobilized and is now seen at a level of the fourth rib posteriorly The collapse obtained in this manner approaches more closely to the ideal of concentric collapse and should permit more effectual closure of cavities
 D, After second posterior thoracoplasty Resection of additional (two, three or four) ribs adds further to the collapse of the diseased portion of the lung

been attempted at some time in practically all Diaphragmatic paralysis had been induced in 24 of them, but during the last two years this had not been done immediately preceding thoracoplasty.

In comparing the reactions following the different stages it was found that the anterior chondrocostectomy gave rise to the least severe. It also seemed to provoke a scar-tissue reaction which aided in stabilizing the mediastinum.

The most serious complications were the result of aggravation of the pulmonary tuberculosis which caused it to spread to the contralateral lung or to progress in a previously existing lesion. The 2 post-operative deaths were due to such complications. The mortality for the series was 4.76 per cent and the operative mortality was 1.37 per cent for 146 procedures. This mortality rate was a marked improvement over that obtained in the series of 42 patients operated upon according to the Wilms-Sauerbruch technique: there were 6 hospital deaths and the mortality rate was 14.28 per cent.

A study of the authors' patients after from six months to three years shows that 50 per cent of them have closed cavities and negative sputum. This percentage also holds for the 10 cases in which apicectomy was added to the thoracoplasty. The authors conclude that although the Semb operation definitely augments the anatomical collapse, there was no evidence in this series that it improved the final results.

RICHARD H. MEADE, JR

HEART AND PERICARDIUM

Saloz, C., and Roux-Berger, J. L.: Precordial Thoracotomy, Brauer's Operation (Thoracotomie pré-cordiale, opération de Brauer). *Mém. l'Acad. de chir.*, Par., 1938, 64: 392.

Saloz and Roux-Berger report the case of a man forty-three years of age, who had had a severe attack of streptococcus septicemia with pleurisy and pericarditis. This had resulted in bilateral phrenocostal symphysis, as shown by radiological examination, and also in cardiac symphysis. There was cardiac insufficiency with edema, passive congestion of the liver and lungs, and a negative T-wave in the electrocardiogram, but there was no disturbance of the cardiac rhythm and no valvular disease. A precordial thoracotomy was done by Brauer's method with removal of the second, third, and fourth ribs. The patient showed definite improvement after operation. A year later, the edema had entirely disappeared and the size of the heart was diminished, as shown by the orthodiagram, but the T-wave still was negative in the electrocardiogram and the enlargement of the liver persisted. The patient was feeling well and able to work. Two years after operation the patient reported that he was in good health, but he died shortly after from a sudden gastric hemorrhage, due to a ruptured blood vessel, which was very probably related to the hepatic cirrhosis.

ALICE M. MEYERS

possibly the escaped air. The author at the same time recalls his experimental work on dogs in the year 1913 in which he was able to show how great a tendency to good spontaneous healing there was even in the presence of large lung wounds provided that a major arterial branch had not been injured if drainage had been provided for by means of valve drainage.

The trocar may be used even in those cases which have hitherto been handled conservatively, because in most of these instances there are complications caused by a hemothorax which later necessitates frequent thoracentesis if the latter is not to become absorbed spontaneously. By means of this trocar the formation of scar tissue is avoided and the period of convalescence is shortened. Furthermore the author recommends the use of this apparatus in the after treatment of empyema.

(Max TRENZEL) HARRY A. SALZMANN, M.D.

Wangensteen O H, Carlson H A and Bowers W F. Partial Thoracoplasty for Pulmonary Tuberculosis with a Suggested Plan of Operation Including Preliminary Anterior Chondrocostectomy Together with a Review of Results. *J Thoracic Surg* 1938 7 353

In the development of the modern type of thoracoplasty the tendency has been to make the procedure as selective as possible and to divide the operation into multiple stages. As another step in diminishing the severity of the operation and in making it more effective, Wangenstein in 1934 began performing an anterior chondrocostectomy as a preliminary stage to posterior thoracoplasty. A survey of the results obtained in 42 patients operated upon by this method in somewhat more than three years has convinced the authors of the value of the plan.

The anterior chondrocostectomy was performed under local or cyclopropane anesthesia. Through a single short transverse incision over the second rib the first three costal cartilages were resected together with short anterior segments of the corresponding ribs. The ribs were stripped posteriorly along their lower borders from the periosteum by means of an O'Brien periosteal stripper to facilitate their complete removal at the time of the posterior operation.

The first posterior operation was done through the usual approach and the previous partial separation of the ribs made their removal easier. Extrafascial apicectomy as described by Semb was added to the thoracoplasty whenever feasible and was accomplished in 20 patients.

At the second posterior operation segments from the fourth, fifth and sixth ribs were usually resected. When six ribs were considered sufficient for adequate collapse the base of the scapula was frequently resected as suggested by Holman to prevent its catching the seventh rib. Further resection of the ribs was done as needed in later stages.

In discussing the postoperative care of the patients in addition to the points upon which all are agreed the authors draw attention to the observation

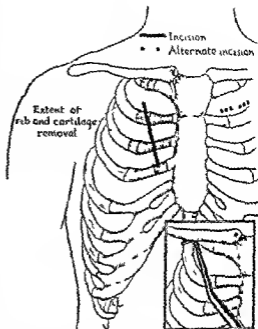


Fig 1. Anterior chondrocostectomy. A suggested plan of operation for thoracoplasty (OHW). The incisions employed are indicated together with the extent of rib and cartilage removal. The oblique incision permits better exposure but the operation can readily be done through a single transverse incision over the second rib. The resulting scar remains less prominent. The inset shows how the second and third ribs are freed from their beds and the intercostal muscle bundles attached to their lower margins.

that gastric dilatation may at times cause dyspnea and tachycardia. This complication was noted mainly after the second or third posterior stage when done on the left side.

External aillary compression with synthetic rubber sponges was used consistently after the second posterior stage. This was started as soon as the wound was no longer tender and continued until osteogenesis produced a firm chest wall usually from six to ten weeks after the last operation. No weakness of the anterior chest wall was noted in a single case following resection of the upper three costal cartilages.

Many patients developed an elevated shoulder on the side which was operated upon. This was thought to be caused by the long continuance of the lateral decubitus position after operation which caused the scapula to become fixed in a high position. Because of this experience the authors believe that the lateral position should not be long maintained unless necessary for a adequate pulmonary collapse.

Among the 42 patients there were all varieties of lung involvement. Twenty of the series apparently had active bilateral disease. Pneumothorax had

individuals Older patients with chronic but uncomplicated lesions whose symptoms are not progressive also do well on a medical regimen Mild postoperative complaints certainly are best treated medically, and, naturally, medical management is the treatment of choice when serious complications are present Hartman, in a recent lecture, stated that satisfactory results could be obtained from medical management in approximately 75 per cent of cases of duodenal ulcer A salient argument for medical treatment was the large number of healed duodenal lesions found by Robertson (58) at autopsy in cases in which a diagnosis of ulcer had never been made Of patients with duodenal ulcer seen at the Labey Clinic (37, 39), only 8 per cent were operated on

Treatment, however, tends to be of value only during its application, and when the indifferent patient leaves his physician's care he is likely to lapse into his usual mode of living with all the exciting causes which produced the original trouble. The modern trend of treatment for this disease emphasizes the need for acquainting the patient with the nature of his trouble and for explaining the rationale of treatment Particularly are stressed the ill-effects of smoking, stimulating gastric secretion as it does and causing contraction of the blood vessels, and of alcohol and improper food, the need for leisure, and the avoidance of excitement Ulcer is a condition as demanding of constant consideration as diabetes and essential hypertension

Of the many forms of medical treatment Sippy's diet-alkali regimen together with the use of sedatives still ranks highest It has been modified to avoid nutritional disturbances and the unbalance of the acid-base ratio Eusterman (15) mentioned the use of whole-milk powder as a substitute for cream and milk mixtures Powdered milk is more convenient and it produces an increased reduction in acidity and the elimination of half the feedings In the treatment of the aged, and when the kidney and liver are damaged, tribasic phosphates may be employed to offset the danger of alkalosis For the control of bleeding tendencies recent investigation has demonstrated the efficacy of an adequate intake of Vitamin C which orange juice can provide

Observations by Rivers on the use of duodenal extract have been limited so far by his inability to obtain sufficient proper material, but they indicate that this extract may be useful in the physician's armamentarium as an adjunct to the usual measures Parenteral administration of protein, histidine, and vaccines, continuous aluminum hydroxide drip and mucin therapy, although use-

ful in some instances, have not been generally accepted.

PREPARATION FOR SURGICAL TREATMENT

Of the various complications of duodenal ulcer, perforation and occasionally hemorrhage are the only two demanding immediate surgical interference Unless due to perforation, pain is rarely so intractable that it cannot be controlled by non-operative measures. Therefore, ample time is generally available for proper care of the patient before he is submitted to operation Certain conditions may have reduced the patient's vitality to a subnormal level and this decidedly increases the surgical risk if measures are not taken to bring about an improvement Such conditions may be loss of blood from hemorrhage, localized peritonitis, periduodenal abscess, and severe pyloric obstruction In the last-named instance persistent vomiting may bring about a poor state of nutrition, the patient may become dehydrated, and there may be loss of certain normal constituents of the blood, such as protein, and the acid-base equilibrium may be upset In addition, the stomach may be overdistended and toneless Only a few days of continuous or repeated suction drainage permit the stomach to resume much of its tone and normal size Body fluids may be restored and the nutrition improved with intravenous injections of glucose and saline solution Protein, if the reduction is notable, may best be replaced by a blood transfusion In certain rare cases of malnourishment, jejunostomy may be a judicious preliminary measure prior to gastro-enterostomy or resection

Because of the ability of the acid contents of the stomach to sterilize, Marshall has recommended that alkali therapy be withheld two or three days before operation. For those who are run down and exhausted nervously by the rigors of their illness a few days of rest in bed, terminating a reasonable number of days prior to operation, make for a smooth convalescence. The pre-operative preparation of the patient with anemia as the result of bleeding from a duodenal ulcer will be discussed in the section on hemorrhagic duodenal ulcer.

INDICATIONS FOR SURGICAL TREATMENT

The indications for surgical treatment are based on extensive clinical and experimental studies Apart from certain fundamentals in selecting cases for operation, importance is attached to the need of careful appraisal of each individual patient with a view toward the selection of the proper procedures to produce the best results in

THE PROBLEM OF DUODENAL ULCER

Collective Review

O THERON CLAGETT, M.D., KENNETH R. TRUEMAN, M.D., and
WALTMAN WALTERS, M.D., D.Sc., F.A.C.S., Rochester, Minnesota

THE literature concerning duodenal ulcer is so voluminous each year and so many of its aspects are controversial that a review and evaluation of the problem occasionally seems indicated.

Most writers now agree that the term "peptic ulcer" should be discarded and that in any discussion very careful distinction should be drawn between the terms "duodenal" and "gastric" ulcer. These two lesions are dissimilar biologically, physiologically, and pathologically. For example, Walton (71, 72) has stated that approximately 10 per cent of gastric ulcers become cancerous and that approximately 30 per cent of cancers of the stomach originate from gastric ulcers, whereas a primary duodenal ulcer rarely if ever undergoes malignant change. From the standpoint of treatment an essential difference also exists. In resection for gastric ulcer relative achlorhydria almost invariably follows the Polya and Billroth I procedures and recurrence practically never takes place. On the other hand Klein, Aschner, and Crohn (35) have reported that relative achlorhydria results in from only 60 to 70 per cent of the cases following the Polya operation and Walters and Wolf in approximately 25 per cent following the Billroth I resection for duodenal ulcer. Graham (27, 28) has said, much harm, confusion and disastrous therapy come from considering these two conditions as a single entity.

Medical treatment has become established on a firmer basis and with greater experience and better diagnostic tests it has been possible to determine more accurately which patients will respond best to medical treatment. It is now generally recognized that from 50 to 75 per cent of all patients with duodenal ulcer will obtain satisfactory results from medical treatment. The surgical indications for the treatment of duodenal ulcer are also better appreciated and there is a definite tendency to suit the surgical procedure to the individual patient. The indications for partial gastrectomy for duodenal ulcer are also becoming

clearer. There has likewise been much controversy concerning the subject of bleeding duodenal ulcer, but from these numerous, almost diametrically opposed opinions there has developed sounder judgment of the indications for, and the value of, the various types of treatment.

Gage and his associates (25) have pointed out that the most important factors in the causation and persistence of peptic ulcer are (1) the inherent constitutional predisposition to form ulcer, that is the ulcer diathesis, (2) the tissue susceptibility to ulcer, and (3) the increased gastric acidity. If this conception of the problem is correct, the clinician's therapeutic endeavors should be directed toward controlling gastric acidity because there is probably little that can be done to change the inherent predisposition and the susceptibility of the tissues. This attitude is definitely sound and just as gastric acidity must be controlled to heal an ulcer, it must continue to be controlled to prevent recurrence after healing by any form of treatment, medical or surgical. That certain individuals, certain races, and even certain individuals from certain localities have a greater predisposition to peptic ulcer or a greater tissue susceptibility to ulceration is true beyond a doubt. It is unfortunate that we have no definite method of measuring this predisposition in tissue susceptibility. Such a method would be of inestimable value in determining the therapeutic procedure to be carried out in a given case. Without such a method one must depend on a careful clinical study and analysis of the case, considering the gastric acid values and the roentgenological and gastroscopic reports.

MEDICAL TREATMENT

Many patients with uncomplicated duodenal ulcer fail to respond to medical treatment because of delay in the diagnosis and lack of efficient treatment over a proper period of time. As in the surgical so in the medical treatment of ulcer, care must be exercised in selecting cases for treatment. Eusterman (14, 15) believed that medical treatment was indicated when symptoms were of short duration especially in the cases of younger

HEMORRHAGIC DUODENAL ULCER

There is considerable variation in the estimates of the incidence of hemorrhagic duodenal ulcer. According to Balfour (4), 20 per cent of patients with duodenal ulcer coming to surgery have a history of hemorrhage. Wilkie and Ryle estimated that hemorrhage occurs in at least a third of the cases of duodenal ulcer, Babey and Hurst (2, 3) in 27 per cent, and Goldman in 38 per cent. Crohn said that 10 per cent of the ambulatory patients with ulcer and 25 per cent of the hospital patients with ulcer have a history of hemorrhage. Allen and Benedict (1) reported that a third of their series of 1,804 patients with duodenal ulcer required hospitalization because of bleeding.

The proportion of hemorrhage in men and women is about 6 to 1. In 90 per cent of the cases there was a history of duodenal ulcer of nine years' duration before the hemorrhages occurred. The onset of hemorrhage can rarely be foretold, it may occur following a particularly severe attack of an ulcer type of distress, but massive hemorrhages have occurred when the patient was having no distress of any kind, and in some cases a diagnosis of ulcer was not made prior to the onset of the hemorrhage.

The severity of the hemorrhage varies considerably. There is no question that hemorrhage from duodenal ulcer is a much more serious complication than is generally appreciated and that the mortality is higher than most realize. Umber (67) has reported a mortality from hemorrhage of 22 per cent for a series of 1,852 consecutive patients with ulcer. Babey and Hurst (3) estimated the mortality to be about 15 per cent, and Allen and Benedict (1) reported a mortality of 3 per cent from hemorrhage in their series of 1,804 cases of duodenal ulcer.

The mortality from hemorrhage in cases of duodenal ulcer, then, is probably from 1 to 3 per cent, the mortality in cases of bleeding duodenal ulcer being considerably higher. In 1935, for example, Tidy, Gordon-Taylor, and Turtle (66) on reviewing all cases of duodenal ulcer over a ten-year period at the Middlesex Hospital reported a mortality of 21 per cent for cases of duodenal ulcer in which the patients were admitted to the hospital with hemorrhage. About the same time Reschke reported a mortality of 9.8 per cent for a series of 1,023 patients with hemorrhage, and Umber (67) has reported a mortality of 9.5 per cent for 433 cases of duodenal ulcer with hemorrhage. Goldman (26) reported that 11.1 per cent of his patients with bleeding ulcers died of exsanguination and that an additional 4.9 per cent died of conditions associated

with bleeding, or in other words a mortality of 16 per cent for patients with gross hemorrhage. Blackford and his associates (7) had a mortality of 11 per cent in their cases of massive hemorrhage from ulcer, Allen and Benedict (1) estimated 14.5 per cent, Tidy and his associates (66) 7.8 per cent; Hurst and Ryle (33) 4.8 per cent; and Lahey (38) about 5 per cent.

It seems obvious, since these reports vary considerably, that the criteria employed in evaluation have probably not been the same, but that the condition is more serious than has generally been appreciated, cannot be denied. All investigators have found that the highest incidence of bleeding is in the fifth decade and that the highest mortality is in the fifth, sixth, and seventh decades. Regarding age, Kruse (36) said that it was generally agreed that a greater proportion of persons more than forty years of age than of those less than forty die as a result of their hemorrhage, the ratio being 8 to 1. Allen and Benedict pointed out that in their series the average age of the patients who died was fifty-six and two-tenths years, whereas the average age of those who recovered was forty-one and eight-tenths years. They believed this finding of considerable value in guiding the type of treatment and in giving the prognosis in these cases. In 60 per cent of their fatal cases the patients died at the first episode of hemorrhage. Death from hemorrhage was rare among patients less than forty years of age. They concluded from this that advancing age with accompanying changes in the blood vessels is one of the greatest factors in mortality from hemorrhage in cases of bleeding duodenal ulcer.

There is considerable controversy regarding the treatment of hemorrhagic duodenal ulcer. Finsterer (19), Haberer, Tidy, Gordon-Taylor, and Turtle are among the chief advocates of surgical treatment, Meulengracht (48, 49), Hurst, and their associates advocate medical treatment.

Meulengracht based his treatment on the following observations:

1. Exhausted patients often die of hemorrhage in spite of scrupulous dieting
2. Patients with protracted hemorrhage sometimes stop bleeding when given food
3. Ambulant patients very often recover from severe melena without any particular change in their ordinary diet

It seemed to him of questionable advantage to starve a patient at a time when he was in special need of support, and he believed it improbable that a diet insufficient in calories and vitamins was a proper means of healing ulcer. From 1931 to September, 1935, Meulengracht treated 251

his particular case. In cases other than those of perforation, Balfour (5) has said that surgical treatment is indicated when the symptoms fail to be alleviated despite proper medical care. Lahey (37) took the same stand when pain persisted in spite of medical management. Thus to these authorities chronicity assumes prime importance in the selection of cases for operation. Balfour has also said that in certain cases the symptoms may be so intractable that operation is warranted even at an early stage. Another reason of essential importance, according to Lahey, is persistent and recurring pyloric obstruction leading to malnutrition and distressing symptoms. One indication for operation in chronic cases, according to Eusterman and Balfour (26), is that about a third of the patients have associated disease of the gall bladder or appendix, conditions which do not yield to medical treatment and which excite the ulcer. A history of subacute perforation is held by many to be an indication for operation. The failure of patients to follow the requirements of medical treatment after the ulcer seems healed and the resultant recurrence are held by some to be another reason for operation. Again, factors pertaining to the economic condition of the patient or his residence away from medical assistance assume importance as indications for surgical treatment. Finally, there is the question of the bleeding duodenal ulcer concerning the treatment of which there is so much difference of opinion. This will be discussed in a later section.

Obstructing cicatricial duodenal ulcer with low acidity. When duodenal ulcer has produced obstruction at the outlet of the stomach by cicatrization or a marked degree of edema, gastro-enterostomy is generally the treatment of choice. The results of the operation tend to be excellent since, in addition to the circumvention of the obstruction assistance is rendered to the impaired motor function of the stomach. Furthermore the factors producing this dysfunction have also reduced the secretory activity of the stomach through atrophy of the gastric glands. Thus if gastro-enterostomy is performed the susceptible jejunal mucosa tends to be freed from the menace of gastric acids. A further advantage has been demonstrated by one of us (Walters, 68), who showed that posterior gastro-enterostomy produces a reduction of from 30 to 50 per cent in the gastric acidity by its neutralization and dilution by duodenal secretions. Graham (27, 28) and his colleagues have found posterior gastro-enterostomy or a Finney pyloroplasty most suitable in the case of such obstructive lesions. In their experience the Judd pyloroplasty and Wilkie type of

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Duodenal ulcer without obstruction and with high acidity. That group of patients less than fifty years of age who have ulcer uncomplicated by obstruction but who have a high degree of free hydrochloric acid is estimated by Graham to present the most difficult problem in the surgical treatment of duodenal ulcer. He believes that the condition requires the most careful medical attention and the fullest co-operation on the part of the patient before operation is to be considered.

Graham offered his results of operative treatment for this group of patients. Eighty nine patients were subjected to posterior gastro-enterostomy. Three deaths, or 3.3 per cent, resulted from a non functioning stoma. Anastomotic ulcers developed in 11 cases. Graham in the light of his increased experience, attributed the latter complication, serious as it is, to the improper choice of surgical procedure in the face of high value for free hydrochloric acid. A series of 9 patients belonging to this group were treated by gastro-duodenostomy, there was 1 death and 1 anastomotic ulcer developed. Wilkie advised against the performance of gastro-duodenostomy in such cases.

The fuller experience of Graham and his associates has led them to employ gastric resection in more and more cases of ulcer without obstruction in which the acidity was high. Their procedure removes the pylorus and most of the lesser curvature of the stomach as advocated by Finsterer (20). The results of partial gastrectomy in this group were better than the results following gastro-enterostomy. In 131 cases there were but 3 deaths or a mortality of 2.29 per cent. Observations extended over eleven years and to date there has occurred but 1 anastomotic ulcer. Graham thought that the more radical the resection the less chance there was of recurring ulceration since the free hydrochloric acid was further reduced. There were no cases in which anemia was not found to be due to a deficiency in the diet. The resultant small stomach proved to be no handicap to the laborer. Lake (40), reporting on 320 cases in which the posterior Polya type of gastrectomy was performed for different conditions (in 193 for duodenal ulcer), found only 3 anastomotic ulcers two years or more subsequently. No cases of pernicious anemia developed and there was a marked general reduction in the acidity. He concluded that in cases of duodenal ulcer without obstruction and with high acidity subtotal gastrectomy is indicated.

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sary if the blood vessels in the vicinity were ligated and if the ulcer was penetrating into the pancreas. Balfour (4) pointed out that 85 per cent of bleeding duodenal ulcers are cured by gastro-enterostomy alone. In selected cases, however, he believed excision of the ulcer or ligation of the blood vessels was indicated. Portis preferred excision of the ulcer or ligation of the bleeding points alone, with resection of the ulcer at a later time.

The results of surgical treatment seem quite satisfactory when patients are operated on early and if an appropriate procedure is selected for the individual patient. Finsterer took the reasonable position that statistics were of no assistance in judging single cases, in the end the patient must be treated according to the merits of the individual case. This we believe to be the soundest viewpoint.

One can therefore conclude from this review of the treatment of bleeding duodenal ulcer that the condition is an extremely serious one and that there is still room for a great deal of improvement. There is much to be said for medical treatment. The work of Meulengracht deserves further study and its possibilities need to be determined, particularly for younger individuals. There seems no question to us that transfusions are of inestimable value and have not, as Tidy and his associates and Christiansen suggested, been detrimental in the treatment of bleeding duodenal ulcer. There is also no question that in selected cases surgical treatment of duodenal ulcer is imperative. This is true particularly in cases of patients past fifty years of age who have massive hemorrhages, and in these cases we agree with Finsterer and Tidy, Gordon-Taylor, and Turtle that operation should be performed as soon as possible.

RESULTS OBTAINED BY VARIOUS SURGICAL PROCEDURES

Relief of pylorospasm and obstruction. It has been definitely established that pylorospasm is an important factor in both the production and persistence of duodenal ulcer and in the production of the symptoms which are associated with it. Wilson has shown that spasm of the duodenal cap and pylorus is always present during pain from duodenal ulcer. This spasm naturally produces a varying degree of epigastric distress and some pyloric obstruction. Both the medical and surgical treatment of duodenal ulcer must lead to efficient emptying of the stomach with absence of spasm in that organ and in the duodenum. Medically this can be accomplished in the ma-

jority of cases by gastric aspiration, by frequent small feedings, by the administration of alkalis, buffers, and other preparations which tend to inhibit gastric secretion, and by the use of antispasmodics, such as belladonna. Surgically, pylorospasm and pyloric obstruction may be relieved by direct surgical attack on the pylorus, such as pyloroplasty, gastroduodenostomy, or gastric resection, or indirectly by gastro-enterostomy. Pyloroplasty eliminates pylorospasm by division or resection of the pyloric muscle, at the same time the lesion should be removed if possible and a large pyloric outlet allowing free regurgitation of duodenal secretions into the stomach should be constructed. Theoretically gastroduodenostomy has much to commend it. The procedure can be performed safely and provides a large free communication between the stomach and duodenum. The disadvantage is that in cases in which it fails to maintain or control the symptoms, or in which a recurrence requires further operation, disconnection of the anastomosis is difficult. Gastro-enterostomy relieves pylorospasm indirectly by diverting the gastric contents from the ulcerated, obstructed duodenum and allowing unobstructed passage of food from the stomach. Gastric resection accomplishes relief of pylorospasm by resection of the pylorus including the duodenal ulcer if possible, and by wide resection of the stomach with gastrojejunal anastomosis. Milanes (51) concluded, after a study of 70 cases in which subtotal gastrectomy had been performed for duodenal ulcer, that resection of the Finsterer type created genuine anti-ulcerous conditions, further, that it achieved satisfactory anatomical and physiological results and permitted relatively normal digestive and nutritional function, and, lastly, that it was vastly superior to gastro-enterostomy and was therefore the operation of choice.

Emptying time. The second principle of the surgical treatment of duodenal ulcer is that the operation must decrease the emptying time of the stomach, in other words, food must stay in the stomach a relatively short period so that there will be less stimulation of the acid gastric secretion by the presence of food and less gastric stasis. Pyloroplasty, gastroduodenostomy, gastro-enterostomy, and gastric resection, if properly performed, will result in a satisfactory emptying time of the stomach.

Strauss and his associates (65), however, have shown that the stomach should not empty too rapidly since, in their analysis of 35 cases in which subtotal gastrectomy was performed, they found that in those cases in which the emptying time

patients with bleeding duodenal ulcer. His treatment consisted of giving the patient a full purified diet with sodium bicarbonate, magnesium subcarbonate, and extracts of hyoscyamine, and ferric lactate. Patients were allowed to eat meat balls, boiled chops, fish balls, omelette, meat and fish gratin, puréed vegetables, and fruit. They were allowed to eat as much as they wanted. A few patients were given blood transfusions on admission. Meulengracht compared his series of 51 cases, in which there was a mortality of 1 per cent, with 289 cases in which the patients were treated by Christiansen in the same city over the same period by the old starvation method, in which there was a mortality of 7.9 per cent. Meulengracht believed that many patients with bleeding duodenal ulcer died of exhaustion, and not of hemorrhage.

Hurst and Ryle's form of medical treatment consisted of starvation from forty-eight to seventy-two hours, large doses of morphine, and transfusions if the percentage of hemoglobin fell below 30. They pointed out that the mortality from gastric operations was higher than the mortality from bleeding duodenal ulcers and, accordingly, they did not believe that a surgical attack was justified. Tidy and his associates advocated medical treatment in the majority of cases and, after reviewing the cases of bleeding duodenal ulcer that he had observed, he concluded that operation could not have reduced the mortality. Meulengracht's mortality of 1 per cent for 251 cases of bleeding ulcer is certainly the best result that has been reported and there seems no doubt that his treatment offers many advantages over the old and more conservative types of medical therapy. As yet, however, no extensive series of cases has been reported by others in corroboration of his results.

The matter of transfusion continues to be a controversial point. Hurst advocated transfusion when the percentage of hemoglobin dropped to 60. Hurst and Ryle, on the other hand, did not believe that transfusion was indicated until the percentage of hemoglobin had dropped to at least 30. Tidy, Gordon Taylor, and Turtle favored collecting as many donors as possible in any case of hemorrhage and instituting a continuous blood drip transfusion if the pulse was more than 100 beats per minute and if the percentage of hemoglobin was less than 50. Tidy and his associates pointed out that continuous drip transfusion is of great value in some cases but that at present it is extensively overused and especially in association with unnecessary operations. Christiansen has reported that although blood

transfusion has been more widely used during the last five years, the death rate from hemorrhage from ulcer has been nearly twice that of the previous five years. MacGuire, Unger, and others held that the blood pressure never returned to normal for some time following hemorrhage and they believed that the clotting ability of the blood was improved by transfusion. Balfour (4) favored transfusion and thought that many lives had been saved by it. The need for maintaining the fluid balance to fight dehydration and acidosis was shown by Meyler. He also demonstrated that massive hemorrhage was followed by a tremendous toxic destruction of protein with an accumulation of nitrogenous end products and an increase in urea, and without a reduction in the blood chlorides or an elevation of the carbon dioxide combining power.

Both delayed and immediate surgical treatment have been advocated for bleeding duodenal ulcer. Finsterer (19) was a strong advocate of immediate operation, pointing out that he had a surgical mortality of 4.3 per cent for a series of 46 cases in which patients were operated on within forty-eight hours of the onset of the hemorrhage and a mortality of 32.7 per cent for 53 cases in which patients were operated on after forty-eight hours. Tidy, Gordon Taylor, and Turtle likewise said, "if surgical attack on bleeding ulcer is being considered, the first forty-eight hours is the optimum time." The advantage of immediate surgical treatment is that the procedure can be carried out before profound shock, exhaustion, and malnutrition have developed. Allen and Benedict advocated operation during the quiescent stage after hemorrhage, believing that the patient could be more safely operated on after he had at least partially recovered from the shock of the hemorrhage. Allen and Benedict pointed out, however, that in cases of massive hemorrhage the situation was somewhat similar to that of pulmonary embolism in which even embolectomy becomes justifiable and that in selected cases emergency operations may be imperative. They also pointed out that at autopsy, in every one of these cases, there was erosion of a large blood vessel by an ulcer on the posterior wall of the duodenum. These vessels were so large that there seemed little possibility that the bleeding would stop without surgical intervention. Limber likewise reported that at autopsy of 21 of 41 patients who died of bleeding duodenal ulcer, a large eroded artery was found to be the source of the bleeding. Finsterer and Haberer advocated resection of the stomach including the ulcer in all cases. Others believed that removal of the ulcer was not neces-

Likewise it was shown that in the intact animal, following a partial gastrectomy including the pylorus, the acidity of the total secretions entering the stomach and of the gastric content was definitely lower than could be accounted for by the diluting and neutralizing effects of the duodenal secretions entering the stomach. After further studies Wilhelmj and his associates concluded that after removal of the pylorus, the concentration of acid fluids secreted by the fundic glands was unchanged, but that, owing to removal of the specific stimulating influence of the pylorus, the quantity of gastric acids secreted was definitely reduced. Lorenz and Schur have shown that removal of the pylorus decreases the production of gastric acid and lessens the probability of recurrent ulcer. Crohn has postulated that the pylorus contains nerve centers that stimulate the production of hydrochloric acid. Friedemann, reporting a series of 2,250 gastric resections for duodenal ulcer, noted a recurrence of ulcer in 4 per cent of his early cases and of only 0.5 per cent in his later cases in which he did a more radical resection, including the pylorus in every case. Spath and Friedemann have both reported recurrences after resection and have found that at subsequent operation removal of a pylorus lowered the gastric acidity and healed the ulcer. Milanes (51) insisted that the pylorus be included in resection in order to eliminate hormonal and nervous acid-stimulating factors located there. Engel (13) went so far as to say that if the pylorus could not be resected because of perforation of the ulcer into the pancreas, the mucous membrane should be removed anyway. Ogilvie (53) for some time advocated radical gastrectomy, but the pyloric antrum was to be left intact on the assumption that the anti-anemic factor originated in this area of the stomach. He has recently reported, however, that he has had a disturbing incidence of jejunal ulceration following gastric resection in cases in which the pylorus was left *in situ* and that he now removes the pylorus.

It is now more or less generally agreed, therefore, that the pylorus is probably the source of a hormone which stimulates acid gastric secretion. The only advantage of leaving the pylorus intact, apparently, is that some of the difficulties of closure of the duodenum are obviated, but if Engel's method of removing the mucosa without muscle is carried out, this is not a very serious problem.

In spite of the evidence that removal of the pylorus is necessary in gastric resections to produce a reduction in the gastric acidity, it is generally agreed that simple pylorectomy without

extensive gastric resection does not lower the gastric acidity materially, and further that in cases in which the Billroth I resection was performed and in which the pylorus was removed a much higher incidence of recurrence of ulcer has occurred than in cases in which a like amount of stomach has been removed by the Polya method and in which the factor of dilution from regurgitation of jejunal contents was present.

It is generally agreed that if a resection is performed for duodenal ulcer, it should be an extensive one and that from at least half to two-thirds of the stomach should be removed. Strauss and his colleagues (65) have shown that resection of less than 30 per cent of the stomach does not lower the gastric acidity and that the results are not satisfactory unless the acidity is reduced materially. Engel believed that at least two-thirds of the stomach should be removed. Ogilvie recommended extensive resection because of the concept that acid secretion is reduced in direct proportion to the amount of acid-secreting cells removed. A more extensive resection should be performed in order to achieve a satisfactory reduction of the gastric acidity if the pylorus is not resected than is necessary if the pylorus is resected.

Removal of the duodenal ulcer. Removal of a duodenal ulcer does not seem to be essential for surgical cure, since ulcers heal rapidly following gastro-enterostomy when they are not touched. In gastric resection the ulcer is removed, if possible, but if the ulcer is of a perforating type any attempt at removal may seriously increase the risk, and this is not warranted. Removal of the ulcer apparently has little or no effect on gastric acidity. Bloomfield (8) advocated removal of the ulcer on the ground that it acted as a trigger zone for motor disturbances which produced discomfort.

In pyloroplasty or gastroduodenostomy the ulcer is usually removed, if possible, but since these procedures are best used in cases in which the acidity is low and in which there is some delay in the emptying time as a result of cicatricial stenosis of the pylorus, removal of the ulcer is not necessary. These procedures are of little value when the gastric acidity is high since neither the pylorus nor any of the acid-secreting portion of the stomach is removed and, as has been pointed out, there is very inadequate regurgitation of the duodenal contents into the stomach, and natural peristalsis carries the secretions forward.

After the Billroth I procedure, although both the pylorus and the antrum of the stomach are removed, the recurrence of ulcer is greater than

was from thirty minutes to three hours there was a better clinical result than in those in which the emptying time was from fifteen to thirty minutes. It is likewise known that the dumping type of gastro-enterostomies is not very satisfactory. Schindler was of the opinion that gastrectomies and gastro-enterostomies are followed by good results clinically if the new stomas function some what like a pyloric sphincter.

Reduction of the gastric acidity Clinical and experimental research concerning the pathogenesis of gastric ulcer has indicated that the treatment which promises the greatest success is that which most effectively controls and neutralizes the acidity of the gastric content and excess gastric secretion, and at the same time corrects any impairment of the gastric function. Since a reduction in the gastric acidity follows almost any operative procedure which as a result of anastomosis between the stomach and duodenum or jejunum allows reflux of intestinal secretion into the stomach it appears that a low postoperative gastric acidity is largely attributable to the dilution or neutralization which is produced by this reflux. This is substantiated by the fact that little reduction of the gastric acidity is accomplished if entero-anastomosis is also performed, but there is marked reduction after posterior gastro-enterostomy or the Polya resection when entero-anastomosis is not performed. Gage (24, 25) has said that entero-enterostomy should never be performed in conjunction with gastro-jejunostomy because the dilution and neutralization factor is lost by this procedure. Likewise, following pyloroplasty or gastroduodenostomy, or even gastric resection of the Billroth I type in which the stomach is joined to the duodenum, the percentage of patients who have a marked reduction in gastric acidity is not so great as that when resection of the Polya type is performed. This is due probably to a lack of reflux of the duodenal secretion into the stomach following these procedures because the natural peristalsis carries the secretion onward following gastrojejunal anastomosis without entero-anastomosis, however the peristaltic force carries the jejunal secretion into the stomach.

Portus and Steinberg and their associates have been strong advocates of the theory that a regurgitation of the alkaline duodenal contents into the stomach was the most important factor causing a reduction in the gastric acidity. Hill and his associates (32) concluded from their studies on dogs however, that neutralization by regurgitated intestinal fluids was not the major factor in lowering acidity following gastric operations, but

that the pylorus was an important link in a mechanism which caused the fundus to secrete acid. Maier and Grossman (45) carried out a procedure on dogs whereby the entire duodenal content was regurgitated into the fundus of the stomach by sectioning of the jejunum and anastomosis of the proximal end to the fundus and the distal end to the end of the stomach, the duodenum being sectioned and the distal end being turned in. They concluded from these experiments

1 In consideration of the rôle of acidity in the production of jejunal ulcers, the analysis of the gastric contents is a very unreliable guide.

2 The greater the regurgitation of intestinal contents into the stomach is after gastro-enterostomy or gastric resection the lower the resultant gastric acidity and therefore this regurgitation will not lower the acidity in the efferent loop.

3 Mechanical factors, such as kinks, stenosis, and muscular spasm, play a rôle in the formation of jejunal ulcer, and the details of the mechanical arrangement in each individual case will be an important factor in the determination of the amount of duodenal content regurgitated into the stomach after a gastric operation and hence may influence the chance of the formation of jejunal ulcer.

4 Considerable digestive disturbance may result from complete duodenal regurgitation.

Milnes reported that in 60 per cent of 70 cases in which resection was carried out for duodenal ulcer there was a satisfactory maintenance of regurgitation and a more or less permanent achlorhydria.

Importance of the pylorus and the gastric antrum Removal of the antrum of the stomach does not seem to be necessary for the reduction of the gastric acidity since it contains none of the acid secreting glands of the stomach. Its removal is included, however in resections of the distal half to two-thirds of the stomach, including the pylorus, and Hlaber and his followers have suggested that the antrum should be removed because they believe that it stimulates acid cells in the fundus to activity.

There has been a considerable amount of controversy regarding the importance of the pylorus in the maintenance of gastric acidity. Edkins was the first to point out that the pylorus in some way controlled the acid secretion of the stomach. Wilhelm and his associates (73) have shown that the total amount of acid secreted by whole stomach pouches in cases in which the pylorus had been removed was from only a fifth to a sixth as much as in cases in which the pylorus was *in situ*.

Likewise it was shown that in the intact animal, following a partial gastrectomy including the pylorus, the acidity of the total secretions entering the stomach and of the gastric content was definitely lower than could be accounted for by the diluting and neutralizing effects of the duodenal secretions entering the stomach. After further studies Wilhelmj and his associates concluded that after removal of the pylorus, the concentration of acid fluids secreted by the fundic glands was unchanged, but that, owing to removal of the specific stimulating influence of the pylorus, the quantity of gastric acids secreted was definitely reduced. Lorenz and Schur have shown that removal of the pylorus decreases the production of gastric acid and lessens the probability of recurrent ulcer. Crohn has postulated that the pylorus contains nerve centers that stimulate the production of hydrochloric acid. Friedemann, reporting a series of 2,250 gastric resections for duodenal ulcer, noted a recurrence of ulcer in 4 per cent of his early cases and of only 0.5 per cent in his later cases in which he did a more radical resection, including the pylorus in every case. Spath and Friedemann have both reported recurrences after resection and have found that at subsequent operation removal of a pylorus lowered the gastric acidity and healed the ulcer. Milanes (51) insisted that the pylorus be included in resection in order to eliminate hormonal and nervous acid-stimulating factors located there. Engel (13) went so far as to say that if the pylorus could not be resected because of perforation of the ulcer into the pancreas, the mucous membrane should be removed anyway. Ogilvie (53) for some time advocated radical gastrectomy, but the pyloric antrum was to be left intact on the assumption that the anti-anemic factor originated in this area of the stomach. He has recently reported, however, that he has had a disturbing incidence of jejunal ulceration following gastric resection in cases in which the pylorus was left *in situ* and that he now removes the pylorus.

It is now more or less generally agreed, therefore, that the pylorus is probably the source of a hormone which stimulates acid gastric secretion. The only advantage of leaving the pylorus intact, apparently, is that some of the difficulties of closure of the duodenum are obviated, but if Engel's method of removing the mucosa without muscle is carried out, this is not a very serious problem.

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In pyloroplasty or gastroduodenostomy the ulcer is usually removed, if possible, but since these procedures are best used in cases in which the acidity is low and in which there is some delay in the emptying time as a result of cicatricial stenosis of the pylorus, removal of the ulcer is not necessary. These procedures are of little value when the gastric acidity is high since neither the pylorus nor any of the acid-secreting portion of the stomach is removed and, as has been pointed out, there is very inadequate regurgitation of the duodenal contents into the stomach, and natural peristalsis carries the secretions forward.

After the Billroth I procedure, although both the pylorus and the antrum of the stomach are removed, the recurrence of ulcer is greater than

following the Polya type of resection. This is probably attributable to the fact that there is an inadequate regurgitation of duodenal contents just as following gastroduodenostomy or pyloroplasty.

Prevention of the recurrence of duodenal ulcer

The aim of all treatment of duodenal ulcer is to heal the existing ulcer and to prevent recurrence of the ulceration. Unfortunately at present, there is no treatment, medical or surgical, that will heal and prevent a recurrence of ulceration in every case. As we have said before, from 50 to 75 per cent of the cases of duodenal ulcer can be handled satisfactorily by medical management, but it is necessary for the medical regimen to be followed carefully without remission or the ulcer will recur. Likewise ulceration will recur in some instances after all types of surgical procedure, particularly if an adequate medical regimen does not follow operation.

Many surgical procedures have been devised to prevent the recurrence of duodenal ulcer. Pyloroplasty is one of the simplest and safest surgical procedures that can be carried out and Judd found it to be applicable in 50 per cent of the cases. He reported 464 cases of duodenal ulcer in which pyloroplasty was performed with excision of the ulcer. Satisfactory results were obtained in 90 per cent of the cases, the mortality rate was 2 per cent. Finney and Hanrahan (18) obtained good results in 86 per cent of 251 cases in which pyloroplasty was performed with excision of the ulcer. Wilkie has likewise been satisfied with his results from this procedure. Snell (61) was of the opinion that while the procedure was extremely useful in the treatment of duodenal ulcer, it was followed by definite recurrence of ulceration in a small percentage of cases and that it was often extremely difficult to determine the presence of recurrent ulceration by roentgenological examination since the duodenum was deformed considerably by the procedure. One of us (Walters 68) has pointed out that this operation does not lower the gastric acidity in a very high percentage of cases because peristalsis carries the duodenal contents onward rather than allowing free regurgitation as it is designed to do. One of the advantages of pyloroplasty however is that if secondary operation for recurrence is necessary, the previous procedure does not add materially to the difficulty or risk of a second gastric operation.

Gastroduodenostomy has apparently the same incidence of recurrence of ulceration as pyloroplasty and the indications for the procedure are practically identical. Like pyloroplasty, it theo-

retically has much to commend it. Both procedures are based on the concept that the tissues closest to the stomach should have the greatest resistance to irritation caused by the passing of acid gastric secretions and therefore, theoretically, they should be followed by a lower incidence of recurrence than procedures entailing diversion of the gastric content into the more susceptible jejunum. The disadvantage of gastroduodenostomy is that any secondary partial gastrectomy that may be necessary is often made quite difficult.

Gastro-enterostomy has been, and shows every indication of continuing to be the most satisfactory surgical procedure for duodenal ulcer in most cases. As one of us (Walters, 60) has previously said "Gastro-enterostomy will heal more ulcers at a lower operative risk regardless of size or shape of the lesion than any other procedure." The incidence of recurrence of ulceration following gastro-enterostomy varies considerably in numerous reported series. Marshall and Kiehl (47) have found the incidence reported to vary from 17 to 24 per cent and they believed that it was probably closer to the latter than to the former figure. Ogilvie said that recurrent ulceration follows in at least 20 per cent of cases in which gastro-enterostomy was performed and Tidy, Gordon Taylor, and Turtle believed that there was recurrence of ulceration in not less than 10 per cent of the cases. Newburger (52) reported an incidence of recurrence of 48.3 per cent for a series of 64 cases in which gastro-enterostomy was performed. Wright on the other hand, reported an incidence of recurrence of 8.49 per cent for a series of 1,730 cases of duodenal ulcer. Balfour (5) reported an incidence of recurrence of 5.2 per cent following gastro-enterostomy at the clinic. Luff (42) reported on 995 cases of duodenal ulcer in which operation was performed by various British surgeons the results of gastro-enterostomy being satisfactory in 89.5 per cent, general improvement following in all but a few cases and the incidence of recurrence of ulceration being only 2.8 per cent. Maes and McFeindge definitely believed that the incidence of recurrence of ulcer following gastro-enterostomy was not as high as many believed. Walton (71), Heuer (31), Dinsmore, Finney (17) and Wilkie have expressed themselves as being satisfied with the results of gastro-enterostomy and other conservative procedures in the treatment of duodenal ulcer.

There is no question that for obstructing duodenal ulcers in the presence of low acidity, gastro-enterostomy is the safest and best surgical proce-

ture that can be performed. Gastro-enterostomy can likewise be used to great advantage in the treatment of many large perforating ulcers. Gastric acidity can be controlled very satisfactorily in the majority of cases by the dilution and neutralization of the acid gastric secretion brought about by regurgitated jejunal content. Relative achlorhydria is produced in a definite percentage of cases in which gastro-enterostomy is performed.

The incidence of recurrent ulceration has stimulated surgeons throughout the world to find some still more satisfactory method of treating duodenal ulcer, and the method receiving the greatest attention at present is gastric resection. That in selected cases it gives excellent results is beyond question, and more and more surgeons who have been dissatisfied with the results of more conservative procedures have turned to it. Lahey (37) has stated his opinion as follows: "It is certain in my mind that jejunal ulcer is too frequent, too difficult, and too dangerous a post-operative sequela to gastro-enterostomy to permit the operation to be employed as a routine surgical method of treating duodenal ulcer. There seems little question that the best surgical results, immediate and remote, are in those ulcer patients who postoperatively have a low gastric acidity or anacidity and that the operation which undoubtedly most consistently does this is extensive gastrectomy." Finsterer (21) has been an enthusiastic advocate of resection for duodenal ulcer, and at one time he reported 292 resections following which only 1 recurrent ulcer developed, this was cured by more extensive resection. The mortality for this series was 2 per cent (64). Ogilvie (53) has reported a combined mortality for primary gastro-enterostomy and secondary resection for recurrent ulcer of about 9 per cent. He took the stand that inasmuch as surgeons could perform resection with a mortality of 5 per cent, the operation of choice which would give the most satisfactory results is "physiological" gastrectomy. In regard to this Fogelson commented that he found it interesting to note that Ogilvie classified a surgical procedure that removed three-fifths of an important organ as "physiological."

That resection is not all that it was hoped it would be, however, is evidenced by an increasing literature containing reports of recurrences. Finsterer later admitted a definite recurrence, the cause of the recurrence following resection being the same as after any other form of treatment, medical or surgical, that is, failure to control gastric acidity. It goes without saying that there is tissue susceptibility to ulceration in any case in

which recurrence develops after healing has once occurred. Klein, Aschner, and Crohn (35) have reported that relative achlorhydria was produced in only 56 per cent of 108 cases of resection for duodenal ulcer and that there was an incidence of recurrent ulceration of 8.3 per cent in this series. Berg has reported recurrence of ulcer following partial gastrectomy in 9 of 47 cases in which relative achlorhydria did not develop. Gastric resection is becoming increasingly popular as the surgical treatment of duodenal ulcer and many reports have been most encouraging, however, it must be remembered that it is a serious operation and cannot be taken lightly. Also, one must not forget that gastro-enterostomy is still a more conservative and safer procedure when properly performed on proper indications, giving results as satisfactory as those of surgery in almost any other field.

COMMENT AND SUMMARY

The problem of treatment of duodenal ulcer is still unsolved. No methods of treatment have been advanced that uniformly control gastric acidity in every case. Statistics seem to be of small avail in consideration of the individual case, and each patient must be treated according to the merits of his individual case and all the factors relating to it. Recurrence of ulceration in every case means that: (1) gastric acidity has not been adequately controlled, or (2) the patient is constitutionally predisposed to peptic ulcer and has a marked tissue susceptibility to ulceration. Tissue resistance to inflammation and ulceration from the hydrochloric acid of gastric secretion is what the successful surgical treatment of duodenal ulcer depends on, for if the tissue is resistant to hydrochloric acid, the patient will have a good result from the recognized types of surgical procedures without recurring ulceration, whereas if the tissue is susceptible to ulceration and if hydrochloric acid continues to come in contact with such susceptible tissues, ulceration will recur. Unfortunately there is no way at present to measure tissue resistance to acid gastric secretion.

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SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Jaeger, F. The Non-Operative Treatment of Hernia (Ueber operationslose Bruchbehandlung) *Arch f klin Chir*, 1937, 190 198

The paraffin injection method of von Persing and Eckstein for the treatment of hernia was abandoned early. Velpeau in 1835 performed the first experiments in which cicatricial tissue was produced by the injection of certain fluids. In Germany this was done by Schwalbe in 1876 and later by Timmermann, Steffen, Wyss and Woltermann, and Birkenheier. In recent years this method of treating hernia has been recommended by many doctors in America, some of whom have done experimental work on animals on this subject. It has been shown that it is possible to produce strong scar tissue capable of closing hernias by the injection of certain fluids. The fluids are chiefly alcohol. In America the Piña Mestre solution which consists of catechu 15, monesia 14, krameria 14, rova canina 15, vaccin myrtus 17, and alcohol (98 per cent) 25 is widely used. Usually up to 15 injections over a period of from two to three weeks are necessary. A truss must be fitted and worn for a long time before and after the injections until the scar tissue becomes solid. Timmermann advises three weeks on the average and uses from 0.5 to 8 c cm of absolute alcohol, but he sometimes injects for a longer period, even up to two years. All reducible hernias with the possible exception of postoperative hernias may be treated. The fact that true cures can be obtained was demonstrated by the findings in 5 patients previously injected who died of other diseases and came to autopsy with hernias which were found to be completely closed.

Steffens reported 4,632 cases of hernia, 1,548 of which could not be followed. He noted recurrences in 88 per cent of the 2,775 cases of inguinal hernia which were followed up. Ferreras noted recurrences in 2 per cent, Mayer, among 2,100 cases, in less than 2 per cent, Piña Mestre, among 8,000 cases, in only 1 per cent, whereas Millan and Cunningham noted recurrences in 8 per cent of 308 cases. According to some authors, however, the recurring hernias are also easily cured.

The complications are cellulitis (0.55 per cent), deep suppuration and fecal fistulas (0.7 per cent), and atrophy of the testicle (0.07 per cent), death occurred in 0.04 per cent, according to Woltermann. More frequent complications are described in the German literature by Magnus Goldhahn and Schmid. The Americans have abandoned the method of alcohol injection almost completely. Jaeger describes a case of intestinal obstruction in which many injections of mineral oil had been made previously, but nevertheless incarceration of the umbilical hernia occurred. Microscopic sections, of

which there are 5 photographs, show the reaction in the adjoining tissue. The author emphasizes the fact that unfortunately injections have been frequently made by laymen who lack anatomical knowledge, and he concludes that it is obvious that the treatment by injection cannot compete with a carefully performed operation which leads to rapid recovery. This should not, however, stop the scientific analysis of results from the injection treatment of hernia. (FRANZ) JOHN A. GIUS, M.D.

Veal, J. R., and Baker, D. D.: Repair of Direct Inguinal Hernia by Osteoperiosteal Graft to the Pectineal Line of the Pubis. *Surgery*, 1938, 3 585

The authors state that for a hernia to occur through Hesselbach's triangle there must be either an anatomical variation in the insertion of the conjoint tendon or there must be a development of some weakness of the transversalis fascia and conjoint tendon in this region. The direct hernia pushes the transversalis fascia forward and the con-

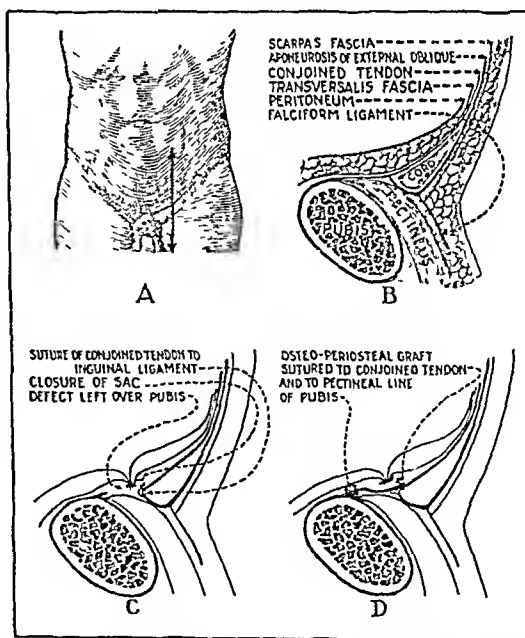


Fig 1 A, arrows indicate position of sagittal sections B, C, and D 1/2 in lateral to the middle anterior abdominal line, B, the normal relations of shelving portion of the inguinal ligament to the conjoint tendon and the pectineal line of pubis, C, illustration of the defect over the pectineal line after the usual operation for repair of a direct hernia, D, showing the closure of defect by means of an osteoperiosteal graft.

joined tendon forward and medially. These structures become thin as the hernia enlarges. It may break through the transversalis fascia and displace or disrupt the attachment of the conjoined tendon to the pectineal line of the pubis. Such a hernia glides over the superior surface of the pubis since the strong sheet of the conjoined tendon normally present is missing.

It is the opinion of the authors that after the usual methods of repair of a direct inguinal hernia there still remains a defect over the pectineal line of the pubis. The normal support of this region is lost when the conjoined tendon is sutured to the shelving edge of the inguinal ligament. It is difficult or impossible to fix any surrounding structures such as the rectus sheath or conjoined tendon, to the pectineal line of the pubis. The authors attempt to bridge this defect with a free osteoperiosteal transplant taken from the tibia.

An incision is made over the medial border of the tibia from 8 to 12 in. in length. The anterior surface of the tibia is exposed. A full thickness osteo-periosteal graft is removed. The upper portion of the graft is made the size and shape to fit into the defect over the pectineal line of the pubis. This portion of the graft is made the full thickness of the periosteum and also contains thin slips of bone. The long tail part is made up only of periosteum. The graft is sutured first to the divided periosteum of the pubis with from two to four sutures of chromic O catgut. It is then sutured to the posterior surface of the conjoined tendon. The long periosteal tail is used as a suture to draw the conjoined tendon down to the inguinal ligament. Two to four additional chromic No. 1 sutures are used to unite the conjoined tendon to the inguinal ligament. The cord is now replaced and the external oblique aponeurosis and skin are closed. The skin incision in the leg is then closed, no attempt being made to close the periosteum.

The authors state that this operation has been done on 14 patients since February, 1937. By means of x-ray and physical examination they have found that within three months the bone becomes absorbed and leaves fibrous scar tissue.

FARL O. LATIMER, M.D.

GASTRO INTESTINAL TRACT

Annes Dias II. Agastria Pathogenesis and Clinical Aspects (L'agastrie aspects pathogéniques et cliniques). *Presse méd. Par.* 1938 46 421.

Annes Dias notes that gastrectomy is being employed more frequently at first used only in gastric cancer. It is now employed in gastric and duodenal ulcer because it effects a radical cure without the danger of postoperative jejunal ulcer.

However when an extensive gastric resection is done with the removal of from two-thirds to four-fifths of the stomach and the duodenal bulb, it is not only the secretion of hydrochloric acid that is terminated. Other important secretions and func-

tions are abolished. These include in addition to pepsin and the lab ferment (1) the anti-anemic hormone (2) secretin which is produced normally by the action of the gastric acid and stimulates pancreatic secretion (3) cholecystokine the hormone studied by Ivy which acts upon the bile secretin (4) enterogastrin and (5) inerrin or duodenin which stimulates the intraluminal secretion of the pancreas.

When gastric digestion is abolished and the production of these various hormones which affect the entire digestive processes is stopped various intestinal disturbances may result. The absence of hydrochloric acid results in the increase of microorganisms in the upper intestines and favors the invasion of the upper intestines by colon bacilli.

However, the most important after effect of gastrectomy is undoubtedly the postoperative anemia. Numerous cases of this type of anemia have been reported in recent literature. The anemia may be of two varieties—true (hyperchromic and megalocytic) pernicious anemia and hypochromic microcytic anemia. The latter type occurs after a considerable percentage of gastrectomies according to recent reports and especially in women. In some cases it has been found that the hypochromic microcytic form of anemia tends to become hyperchromic and pernicious as it progresses. Achylia is as typical of this type of hypochromic anemia as it is of pernicious anemia whether the achylia is the result of gastrectomy or is a non-surgical achylia.

Lack of iron due to deficient absorption and absence of the gastric anti-anemic factor are the chief causes of the anemia following gastric resection. Other factors such as deficiency of Vitamin B or an endocrine factor are secondary. It is probable as Morris has suggested that if the iron deficiency predominates the anemia is hypochromic if a deficiency of the anti-anemic factor predominates the anemia is hyperchromic.

One case is reported in a woman who after gastrectomy for a duodenal ulcer developed symptoms of hypothyroidism and ovarian deficiency and also an anemia with both macrocytosis and microcytosis and a color index of 0.99.

The author is convinced that gastrectomy should not be employed as the routine treatment for peptic ulcer, its possible effects, and especially the danger of severe anemia should receive more serious consideration.

ALICE M. MEYERS

Moutier F. and Debray C. The Juxta-cardiac Region of the Stomach in Gastroscopy (La région juxta cardiaque de l'estomac en gastroscopie). *Presse méd. Par.* 1938 46 433.

Moutier and Debray note that when the gastroscopy is introduced past the cardia, it enters a sort of antechamber of the stomach and the visibility is limited. For better visualization air should be insufflated slowly and carefully. With patients lying on the left side the posterior wall shows numerous folds on the anterior wall the fold are much fewer.



Fig 1 The subcardiac recess



Fig 2 The tumor-like ulcer

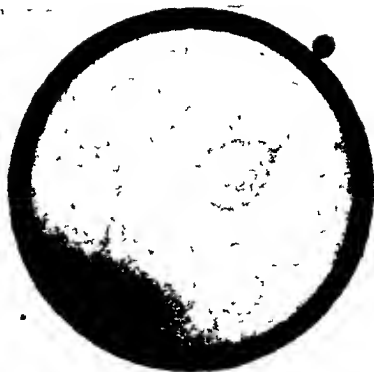


Fig 3 A sessile polyp

The fundus may be seen in perspective, but the pylorus is too far away from the instrument to be clearly visible. The mucosa of the esophagus extends downward toward the lesser curvature of the stomach, its folds are longitudinal and the posterior wall of the juxtacardiac region at varying distances from the lesser curvature may appear like a diverticulum with which endoscopists should be familiar.

A recess just below the cardia may also be mistaken for a diverticulum, it is present in about 1 of 10 subjects and has no pathological significance. It is situated on the posterior wall from 3 to 4 cm below the cardia, it is contractile and may show considerable variation during the examination, but surgical exploration has shown that this recess is not a true diverticulum.

Normal gastric contractions may begin in the juxtacardiac region, or there may be spasm below an ulcer or above a cancer. Gastritis may also cause spasm in the region below the cardia. In addition to annular spasms in this region, spasm involving only a segment of the wall may occur. Gastritis is often found in the region of the lesser curvature. Hypertrophic gastritis is not so frequent in this region as in the fundus, the gastritis is characterized most frequently by an erythematous appearance with pulsatious areas, and small erosions, scarcely visible. Atrophic gastritis may also be found in this region.

Gastric ulcer is not infrequently found within about 4 cm of the cardia. The ulcer is surrounded, as a rule, by inflammatory tissue, so that it appears in the gastroscope as a more or less rounded mass of a dark red or sometimes a grayish color, somewhat like a malignant tumor, only careful observation will show the actual ulcer.

The upper part of the stomach is the site of predilection for benign polyps, especially on the anterior wall, these polyps may be flat, pedunculated, or sessile, and covered with normal mucosa. Cancer may be found in the juxtacardiac region, as well as in all other portions of the stomach. With cancer there is always definite infiltration of the gastric wall.

When the cancer is advanced and projecting into the lumen, it is impossible to introduce the gastroscope further into the stomach. The tissue of these cancers is friable and easily broken down. Gastrosopic examination of the juxtacardiac region is of interest, because ulcer and cancer in this region often cause few symptoms clinically.

ALICE M MEYERS

Wulff, H. B.: The Occurrence of Ulcer Carcinoma and of Carcinoma in the Stomach with Ulcer (Ueber das Vorkommen von Ulcuscancer und Carcinom im Ulcuscummen). *Acta chirurg Scand*, 1938, 80 433.

The material studied was comprised of 609 confirmed cases of gastric carcinoma treated at the Surgical Clinic of Lund from 1924 to 1933. It was divided into two groups.

The first group consisted of 489 cases of gastric carcinoma in which there were no symptoms or findings suggestive of an ulcer prior to the development of the gastric carcinoma. In this series the history of symptoms ranged from no symptoms to symptoms over a period of three months for 26.7 per cent, from three to six months for 29.3 per cent, from six to twelve months for 27.3 per cent and for more than twelve months for 16.7 per cent. The presence of a previous ulcer in this group was not considered by the essayist.

In the next group of 120 patients the history, physical findings, or laboratory work suggested a previous ulcer. Sixty-nine of these 120 patients had long-standing digestive disturbances, but the picture was not typical enough so that an absolute diagnosis of gastric ulcer could be made. In the remaining 51 patients the findings were so characteristic that an ulcer diagnosis could be made with assurance. Twenty-eight of the latter 51 had characteristic pain occurring in the proper area and with the proper periodicity. Twenty-one of the 51 showed, in addition to typical ulcer pain, such characteristics of ulcer as hemorrhage, perforation, and niche formation. Eight of these 21 had ulcer hemorrhage over a period varying from two to thirty years prior to the

diagnosis of carcinoma. It was therefore possible to make a diagnosis of previous ulceration in 51 of 609 patients with gastric carcinoma or in at least 8.3 per cent of the cases of gastric carcinoma treated in the Lund Clinic from 1924 to 1933. A previous diagnosis of either gastric or duodenal ulcer could be made.

It was of further interest to know that in 1921 Petreine collected from the same hospital 109 definite cases of gastric carcinoma which were treated from the years 1898 to 1908 and concluded that at least 8.5 per cent of the gastric carcinomas had been preceded by gastric ulcer. Carcinoma probably had an ulcer basis in 2.1 per cent of the cases. In 1.5 per cent this diagnosis of carcinomatous ulcer could be made and based upon histopathological examination. In 0.8 per cent the diagnosis could be verified by roentgen examination because an ulcer had been demonstrated previously at the site of the carcinoma and in 0.2 per cent the diagnosis could be made both histopathologically and roentgenologically.

SAMUEL J. FOGELSON, M.D.

Allen A. W. Total Gastrectomy for Carcinoma of the Stomach. *Am J Surg* 1938 39 35

During the decade from 1926 to 1936 713 patients with carcinoma of the stomach were admitted to the Massachusetts General Hospital Boston. Of these 254 were not operated upon, but 28 (11 per cent) died in the hospital. The majority of these were deemed inoperable after physical examination and roentgen ray studies and some after peritomeoscopy.

A considerable number were offered exploration but refused it. One hundred and sixty patients were subjected to exploration only because studies failed to reveal positive evidence of their unamenable condition. Thirty (18 per cent of these) succumbed before convalescence had progressed sufficiently for their discharge.

One hundred and five of the 713 had palliative operations, the majority of these being gastroenterostomy. However a considerable number had transections of the stomach proximal to a fixed growth and a posterior Polya anastomosis with the distal segment of the cut edge of the stomach turned in so as to leave the disease excluded. The mortality in the palliative group was 35 per cent.

In 126 cases partial gastrectomy was done. These operations included all partial resections from excision of the antrum to subtotal gastrectomy. In a few an involved segment of transverse colon or pancreas was included in the resection. The mortality in this group was 33 per cent. End results will be published on the survivors by Parsons and Welch.

In this past decade 16 total gastrectomies have been done in this hospital. 5 patients were operated upon by the author and in the remaining 11 cases 8 other members of the surgical staff participated. Fourteen of the patients had cancer of the stomach, 2 had lymphoma superimposed on an old ulcer for which gastro-enterostomy had been done previously and the remaining patient had a large benign

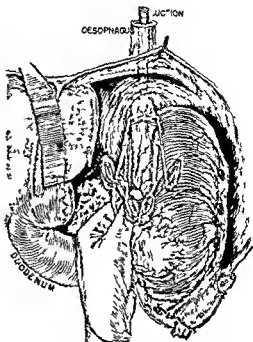


Fig. 1. Schematic drawing illustrating the exposure of the lower end of the esophagus. Note that Levine tube has been withdrawn from the stomach sufficiently to allow the tube to rest in the lower esophagus. The left lobe of the liver has been detached from the diaphragm and held out of the way by a flat retractor. (Courtesy of *Am J Surg*)

ulcer that was thought to be cancer at the time of operation. Eight or exactly half of the patients survived the operation and left the hospital in a comfortable state of health. Five are still living at the time of this report, but 2 of them are believed to have had recurrences nine months and three years respectively after operation. Two are believed to be free of recurrence fourteen months and four and one half years respectively after operation. The patient who had an ulcer is thought to be well although she cannot be traced at this time. The patient living the longest time so far had a highly malignant adenocarcinoma with metastases to the regional lymph nodes.

An analysis of the operative technique employed on these cases, a study of the literature and various suggestions that seem applicable have brought about a possible standardization of the operative technique for total gastrectomy which the author believes may be carried out in suitable cases with a reasonable expectation of immediate success. It seems likely that an occasional five year cure may be obtained and in all cases the author has had the satisfaction of having offered these otherwise hopeless individuals a comfortable respite that is well worth while.

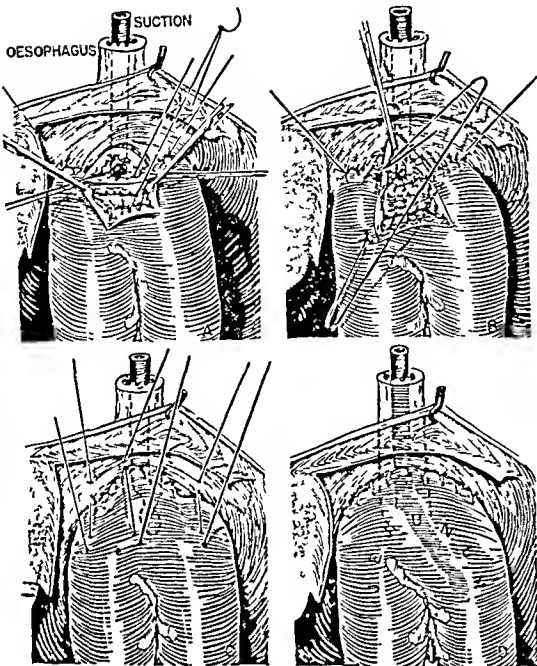


Fig 2 Schematic drawings A and B, illustrating a careful approximation of the open end of the esophagus to all layers of the jejunum. The sutures are carried completely around the stoma inverting the mucous edges. C and D, the anterior wall of the jejunum is approximated to the diaphragm completing the original circle of fixation sutures.

The type of anastomosis in relationship to the mortality in this group is suggestive. Three patients had esophagoduodenostomy and all died. The tendency of such a suture to separate and produce a fatal peritonitis was recognized by Finney and Reinhoff. Eight patients were operated upon in the manner described in detail below with only 2 operative deaths. One death occurred from peritonitis and pulmonary infection and the other from lobar pneumonia seven days after operation. In the latter case there was involvement of the transverse colon and pancreas which necessitated the removal of the whole stomach, a section of the transverse colon, the spleen, and two-thirds of the pancreas *en bloc*. A detailed report of this case record has been made.

OPERATIVE TECHNIQUE

Figures 1 to 3 illustrate the method which the author believes at present to be a logical procedure. He thinks the patient will withstand operation better if he is kept in the hospital several days for rest and the establishment of a fluid and salt balance. During this time, blood transfusions, glucose, and civitamic acid are administered. With the patient at his best, the operation is planned so that time is no factor.

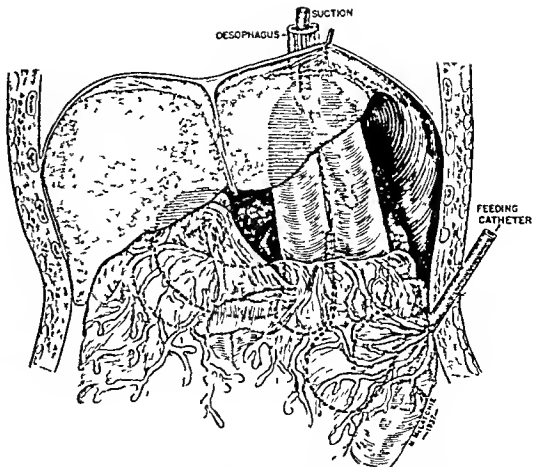


Fig 3 Schematic drawing illustrating the Levine tube brought down through the esophagojejunostomy stoma into the distal limb of jejunum. The left lobe of the liver has been reattached to the diaphragm. An entero-enterostomy has been made at a low level between the jejunal limbs. A jejunostomy for feeding has been established.

The anesthesia can be local to the abdominal wall with splanchnic block, usually supplemented with nitrous oxide, oxygen, and ether in a closed machine. A well-given intratracheal anesthesia of the above mixture is ideal from the surgeon's standpoint, and in certain types of patients, particularly those with deep anteroposterior proportions, it may be best to use this from the onset. A Levine tube is introduced into the stomach before the anesthesia is started.

Postoperatively, the feedings should be put into the jejunostomy catheter for two weeks. This is done best with a continuous drip apparatus which should be regulated in such a manner that distention is reduced to a minimum. Normal salt solution or sterile water is used for the first forty-eight hours, then broth, dilute milk, and egg albumin are added. As soon as the patient is eliminating gas freely any liquid food can be used.

Stomatitis and diarrhea have complicated the convalescence in some of these cases. The author believes they can be eliminated by the administration of civitamic acid before and after operation with regulation of the type of food introduced through the jejunostomy. High caloric mixtures should be avoided in the early feedings and non-gas-producing liquids used. In one instance, the author thought that the addition of dilute hydrochloric acid to the feedings helped to control the diarrhea. The patient is allowed a small amount of water by mouth after the third day. Feedings are begun and well established by this route before the jejunostomy tube is removed. The patient should be discharged on a well-balanced diet and should be urged to eat finely chopped meat and liver. It is surprising to see them gradually extend the time interval between feedings.

and augment their ability to increase the amount of food taken at one time without distress. The patient in this series who has survived the longest number of years eats three substantial meals a day with only occasional feedings in between. He has maintained his normal weight, blood picture and works regularly. He complains a bit about having to take most of his food in a finely divided form and gets some discomfort if he eats too rapidly.

J THORNTON KIRKSPON M D

Todyo T. Acute Intestinal Obstruction. *Ann Surg* 1933 107 340

The author presents a statistical survey of the cases of 342 patients with acute intestinal obstruction who were operated upon during the last fifteen years.

Intussusception constituted 45 per cent of all cases of ileus.

The partial or total lack of fixity of the ascending colon to the posterior abdominal wall is considered a significant factor in the formation and development of intussusception. There were 154 cases of intussusception in 38 of which it was found that the ascending colon lacked its normal fusion to the posterior abdominal wall in its entire length, and in 39 of which normal fusion was lacking in the upper first or second third of the ascending colon.

The average operative mortality in the entire series was 32 per cent in the cases of intussusception alone it was 24 per cent.

The factors which may reduce the operative mortality in such cases are early diagnosis and immediate surgical interference in the earliest stage of the disease.

In severe cases of acute intestinal obstruction surgical procedures must be reduced to the minimum. For this reason the author has frequently produced an oblique fistula by the use of a thin rubber tube. This procedure prevents the occurrence of a permanent fecal fistula which is the result when a direct intestinal fistula is produced.

A special method of procedure which permits the earliest possible closure of the transverse intestinal fistula is suggested.

SAMUEL KAHN M D

Van Beuren F T and Smith B C. Acute Ileus. *Ann Surg* 1933 107 321

The careful study and analysis of 4 series of acute cases of ileus have been helpful in reducing the mortality in such conditions.

The factors chiefly responsible for the improvement seem to be (1) earlier operation partly due to routine pre-operative roentgenological examination (2) a better understanding of the problem to be solved (3) the more frequent use of spinal anesthesia (4) greater replacement of fluid and electrolytes and (5) the more frequent use of peristaltic drugs and rectal treatments.

Continued improvement in the results will probably depend largely upon earlier diagnosis.

SAMUEL KAHN, M D

Laglander H. Experiences with Peritonitis Serum in the Treatment of Appendicitis (Erfahrungen mit Peritonitisserum in der Appendicitisbehandlung). *Helv med Acta* 1933 4 631

In general the experiences with peritonitis serum in the treatment of appendicitis have been favorable in Switzerland also, Henschen, Nobel, Beck, and Barth are favorable and only Urech has been unfavorable to this method of treatment. In the eight years between 1928 and 1935 135 of 817 patients with appendicitis had perforations and showed beginning or far advanced peritonitis, 27 or 2 per cent of these died. From 1936 to 1937, 214 were operated upon 49 of these had perforation and only 2 (1 per cent) died. One of these was a seventy-eight year old man who did not die of peritonitis but of marasmus, four weeks after operation. The author usually gives three doses of 25 c cm for two or three days the first dose being intraperitoneal, the subsequent doses intramuscular to prevent anaphylactic shock. Only in very severe cases of peritonitis are 6 injections of 5 c cm needed. The author mentions the rapid fall in temperature and the improvement both subjectively and objectively. The serum of the Swiss Serum Institute is preferred as it is a bovine serum and is mixed with serum antagonistic to the colon bacillus and the gas bacillus. Furthermore, it does not contain phenol.

In the discussion Urech states that he did not have any success in 215 cases 21 of which were treated with serum. The mortality was 22 per cent as against 23 per cent in the years prior to the use of serum. In a second series 480 cases were operated upon and in 25 serum was used with 3 deaths. Of 66 late cases serum was used in 26 with 6 deaths.

(FRANCE) JOHN A. GUY M D

Hosemann H. The Prophylactic Appendicostomy in the Treatment of the Most Severe Suppurative Perforative Peritonitis (Die prophylaktische Appendicostomie bei der Behandlung der schwersten eitrigen Perforationsperitonitis). *Arch f Klin Chir* 1937 200 164

In contrast to the assumption of numerous physicians the author does not consider toxicosis as the cause of peritonitic intestinal paralysis, especially not in its initial stage. He differentiates 2 types of peritonitic ileus: (1) the ileus from adhesions appearing weeks later and (2) the ileus from agglutination appearing simultaneously or in association with the peritonitis. In the earlier stage of the peritonitis an ileus from adhesions is almost excluded as in this case there is usually only a post-operative ileus from agglutination which as it is still fresh separates spontaneously. It is not advisable to release these agglutinations operatively as peritonitis would be produced thereby.

In agreement with Hottz the author considers the metoconism as the cause of the ileus whereas the peritonitis is evaluated only as an associated phenomenon. The author differentiates the early peritonitic and the late peritonitic obstruction of the

bowel. He defines the former as a condition on the order of shock resulting from peritonitis after a sudden perforation of the organ. Like Petermann, he considers the loss of the intestinal activity in this stage as a sort of automatic protection, which prevents a dissemination by the absence of the peristalsis. However, the slight agglutinations resulting therefrom can lead to kinks and valvular closures because of the meteoric distention of the gut.

In contrast to the early peritonitic stage, only parts of the intestine are involved in the late stage, and drug therapy is not indicated, as a stimulation of the intestinal activity would lead only to more marked kinkings and valvular closures. The picture of the late peritonitic stage appears somewhat like this: the intestinal walls, stretched by distention, become permeable to bacteria and the peritoneum is flooded with highly virulent microbes and, furthermore, the blood vessels of the intestinal wall may be compromised by the internal pressure, from which necroses, gangrene, and perforation may result. Consequently, the ileus is the cause of the toxicosis and not the reverse, as is frequently assumed.

In 1902, Heidenhain used the postoperative intestinal fistula, which, if applied previously to the complete paralysis, often produces surprisingly rapid curative results. As a result of the elimination of the internal tension in the intestinal tube, the valvular closures open and the kinkings smooth themselves out spontaneously. Nature itself showed the way to the surgical treatment of peritonitis: there was frequently observed a strikingly rapid recovery from the spontaneous perforations of the suppurative exudate through the abdominal walls. With the later ventures to open the abdominal cavity, the now generally recognized surgical treatment of peritonitis became established. On the basis of numerous publications appearing already at the turn of the century, the author shows that recoveries from perforative peritonitis occurred at all times without intestinal suture.

Enterostomy has achieved its recognition in wide circles. The objections of its opponents, for example Sprengel, that after peritonitis there are many kinks that require several enterostomies, is disproved by Vollhardt. In this initial stage the emptying at one point of the intestine suffices to bring one intestinal coil after the other into activity. Another objection is the danger of inanition with the persistence of a fistula of the small intestine. The author replies that this does not apply to low enteric fistulas, as numerous cases in which such fistulas always closed themselves spontaneously show. In regard to the high enteric fistula there was danger until Witzel and Kader introduced the oblique canal with the rubber tube.

In a summary of the advantages of enterostomy the author shows that a primarily applied fistula, applied immediately at the first operation before the intestine could become paralytic, acts as a prophylactic and gives the best results. In contrast to the views of other surgeons, Hosemann supports the

principle of doing enterostomosis in every severe suppurative diffuse peritonitis, even when it is not yet complicated by ileus. This intervention, supported by the infusion of ether, prevents the development of the dreaded late peritonitic intestinal paralysis. The author believes the objection to the prophylactic enterostomy (as one cannot be certain beforehand whether the reflexly paralyzed gut would lead to obstruction) to be repudiated by the fact that the inconveniences produced by the application of a fistula are very slight in comparison with the danger occasioned by the omission of this intervention.

With regard to the question, at what point the prophylactic enterostomy is to be applied, different answers are given. Sick mentions the lowermost part of the jejunum, whereas Keetley back in 1894 proposed the appendicostomy. In 1909, Wilms was the first German to define his position on this question by recommending appendicostomy because of its simplicity and great effectiveness.

In summary, the author shows that this method of the primary and, particularly, of the prophylactic appendicostomy has proved its advantage over the other methods by its brilliant curative results. Even when in a borderline case a postperitonitic ileus does develop, a high enteric fistula can at any time be combined with the appendicostomy. As to the results with the use of this method, the author reports that in 24 of 27 cases of the most severe diffuse suppurative peritonitis the patient could be saved.

The author also calls attention to the fact that the result of the appendicostomy is aided by a simultaneous, accurately dosed (50 to 100 c cm) infusion of ether. The infusion of ether has a favorable effect on the entire organism. Ducreux explains this effect theoretically as a complex result of bactericidal power, cardiovascular influence and hyperemia of the intestine, and stimulation of the peristalsis. (SEIRING) LOUIS NEUWELT, M D

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Uffreduzzi, O : Two-Stage Operations on the Biliary Tract (Operazioni in due tempi sulle vie biliari) *Minerva med.*, 1938, 29 : 169

It is well known that patients with obstructive jaundice are poor surgical risks. This is due to a multiplicity of factors, such as the altered condition of the blood, the loss of detoxifying power of the liver, and the biliary stasis which predisposes to infection. These patients are therefore prone to hemorrhage, intoxication, and infection in the course of any surgical intervention.

Uffreduzzi suggests that in any case in which surgery on the biliary tract is contemplated, the functional capacity of the liver should be ascertained as accurately as possible. He admits that often this cannot be done because of the many factors entering into play and because of the unreliability of our liver-function tests. In general it may

be stated, however, that an icteric individual with complete biliary obstruction is more apt to develop hepatic insufficiency than an icteric individual with a partial obstruction.

The author believes that in cases presenting an obstruction of the biliary tract it is not a good plan to remove the obstruction by a one stage operation. It is more rational to combat first the condition of increased pressure within the biliary tract and prevent the resulting harmful consequences. In these conditions, therefore, it is most urgent to reestablish the bile flow and to restore the normal pressure within the biliary tract by way of a fistula.

The bile should be allowed to flow to the exterior rather than to drain into the intestine because in the latter case toxic substances and bacteria will be reabsorbed into the system.

When the bile is allowed to drain to the exterior it is also possible to explore the biliary tract roentgenologically by the injection of lipiodol into the biliary fistula.

The author thus advises that the biliary operations be divided into two stages. The most commonly used surgical methods are cholecystostomy, opening of the cystic duct or drainage of the latter through the gall bladder. In some cases it may be necessary to perform a choledochotomy and to insert a Kehr tube for drainage, but no attempt should be made to extract any stones which have become fixed to the lower segment of the common duct.

The interval which should elapse between the first and the second operation varies from case to case. The general criteria for proceeding to the second operation are indications such as disappearance of the icterus, improvement of the patient's general condition, gradual subsidence of the fever and especially improvement of the functional capacity of the liver.

The second operation will depend upon the individual case. Among a total of 9 cases the author performed a choledochotomy at the site of the stone in 6, a transduodenal papillotomy was performed in 2 because the stone was wedged into the papilla and a choledochoduodenostomy was done in 1 case because the stone was extremely friable. The author recommends that if the stone cannot be dislodged it may be advantageous to transform external drainage into internal drainage by means of a cholecystogastrostomy. With the 3 methods he was able to obtain very satisfactory results in his series of treated cases.

RICHARD E. SOMMA, M.D.

Best R. R. and Hicken N. F. The Therapeutic Value of Glycerol Trinitrate in Biliary Colic and in the Postoperative Phase of Biliary Tract Disease. *Am J Surg* 1935 39 533

The histological study of the extrabiliary system revealed more abundant muscle tissue in the fundus and neck of the gall bladder wall than at the site where the cystic duct approached the common duct. The so called *collum cysticus* sphincter was not identified. The hepatic and common bile ducts

consisted mainly of fibro-elastic tissue with cattered strands of muscle tissue down to the region of the ampulla and the sphincter of Oddi where non striated muscle again appeared and reached its maximum thickness. It formed a sphincter which mechanically guarded the entrance into the duodenum and which clinically induced a typical sphincteric syndrome.

Atropine, morphine and atropine, epinephrine, ephedrine, magnesium sulfate and fats such as cream or olive oil, were found to be effective either individually or in combination, in relieving only a small percentage of cases.

The authors experimented with the use of glyceryl trinitrate in three groups of cases.

1. In ordinary biliary colic when the gall bladder had not been removed glyceryl trinitrate gave relief in some cases and was a failure in others.

2. In the case of patients whose gall bladder had been removed some years previously but who still had attacks of biliary distress glyceryl trinitrate gave immediate relief when other anti spasmodics had failed. With the use of this drug it was noted that small stones were released from the common duct there being no relief if the stones were too large to get through the choledochus sphincter or were caught in a narrowed portion of the common duct.

3. In cases of patients with spastic biliary dys-synergia, who were carrying common-duct tubes or catheters and in whom the distress was caused by a disturbance of the sphincter of Oddi glyceryl trinitrate often brought about immediate cessation of pain when the combination of morphine and atropine had not given the desired relief. Glycerol trinitrate may be used in combination with morphine as the relaxing effect of the glyceryl trinitrate on the sphincter seems to be greater than the spastic effect of the morphine on the duodenal wall. Atropine appears to give the most relief if the gall bladder and cystic duct are involved. When there is an active pathological condition atropine or a combination of morphine and atropine has not always been found to be effective.

The greatest success with the use of glyceryl trinitrate has been obtained in those cases in which rather typical distress recurred following the removal of the gall bladder. RICHARD J. BEVYTT, JR., M.D.

Livraga P. Hepatic Autolysis in the Biochemical and Bacteriological Studies on the Cause of Death from Hepatolysis (*L'autolisi epatica in vivo*). *Reperti biochimici e batteriologici della causa mortis per epatolisi*. *Clin. Chir.* 1935 14 75

The publication on death from autolysis of the liver are controversial and center about two viewpoints: (1) the infective theory particularly in connection with anaerobes of the *Welch* type (Ellis, Dragstedt); (2) the theory pertaining to toxic products of cellular disintegration (Mason, Palmer, Salemann). Some believe that a combination of these two factors is the cause of death from hepatic autolysis.

Andrews and Hrdina claim the cause is a toxic albumose, Mason and his collaborators think it is a peptone, and Palmer suggests that the fatal intoxication is due to polypeptides.

Regardless of the pathogenesis, all authors describe a severe toxemia or intoxication which causes profound anatomical changes in the liver and kidneys, which are designated clinically as the hepatorenal syndrome. Mason and Lemon stress the existence of a state of anhydremia, which causes death in experimental animals.

The author in his previous report has called attention to Eppinger's studies which suggested intoxication by allyl and tri-methyl-amine. These toxic amines are found in the urine and pus, the author has also demonstrated the presence of acrolein.

The author carried out experimental studies in dogs after placing autogenous implants of liver into the peritoneum. In particular, he was interested in these toxic products and made careful studies of the blood. He also made careful bacteriological studies on the liver after resection and implantation and in a state of autolysis. Eppinger has reminded us that bacterial contamination may be a post-mortem phenomenon.

Histologically, the author observed swelling of the Kupffer cells, serious lesions of the hepatic sinusoids with profuse hemorrhage into the acini and edema of the arterial branches and the walls of the veins. The author also observed inflammation of the serous membranes.

He discusses the possibility of molecular degenerative products of the liver which act as specific elective poisons with positive chemotaxis to the residual liver. Mascherpa has proved the reality of a positive chemotropism of proteins of an organ for the tissues of that organ in his studies on metal combinations of proteins with cobalt. Naturally, in the autolytic disintegration of liver parenchyma, degenerative products of liver proteins are formed. Thus Helwig and Orr demonstrated hypercreatinemia in their clinical and experimental studies on the hepatorenal syndrome, Jankelson, Segal, and Aisner demonstrated hypertyrosinemia in degenerative hepatic disease, and Ritter demonstrated a hyper-amino-aciduria. The author himself found an increase in the residual nitrogen. The nauseating odor of autolysing liver indicates the presence of mercaptans probably derived from indole and skatole.

The renal lesions encountered were secondary to the hepatic changes.

In conclusion, the author notes that when a small piece of liver is left in the abdomen rapid and massive autolysis occurs. In this process highly toxic substances are formed which have an elective organotropism which induces necrotic, degenerative, and vascular lesions in the residual liver. This starts a vicious circle by throwing into the circulation degenerative products from the liver. This secondarily induces renal changes. These hepatic and renal toxic changes lead rapidly to the death of the animal.

The peritoneal inflammation due to endotoxins leads to anhydremia and serous inflammations.

Finally, the author concludes that death from hepatic autolysis *in vivo* depends on two individual factors (1) toxic, and (2) hemodynamic. Bacteria play no decisive part in the mortality. There is also a probability of other acting causes as yet unknown.

JACOB E. KLEIN, M. D.

Rigney, L. J., Mortensen, W. L., and Miller, T. G.: The Diagnostic Value of Duodenal Drainage and of Cholecystography in Gall-Bladder Disease. *Am J Digest Dis & Nutrition*, 1938, 5, 1.

The authors made a diagnosis of cholecystitis, with or without stone, in the cases of 30 per cent of their patients who complained of digestive symptoms. Observation of a group of operatively proved cases indicated that duodenal drainage and cholecystography, together, rarely failed to be of aid in the diagnosis of gall-bladder disease.

In each of the authors' 137 cases, 1 or more satisfactory duodenal investigations and at least one, often three or four, reliable cholecystographic investigation was made previous to operation. When the question of function arose, the authors were inclined to record it as good, rather than as poor or impaired.

Operations for the removal of the gall bladder were performed in the cases of 120 patients, following which a microscopic and gross examination of the organ was made. The cases were unselected except for the elimination of those which, in a preliminary study, had been found unsatisfactory.

The cases are considered in two main groups: patients with stones (100), and patients without stones but with evidence of some gall-bladder pathology (37). Each group is discussed separately. A third group of 12 cases, made up of certain cases from the two main groups and composed of patients having gall bladders of the "strawberry" type, is also discussed. Included in the article are tables showing the age, sex incidence, diagnostic significance of various observations, and conflicting observations in the consideration of these cases by means of cholecystography, duodenal drainage, and operation.

In the diagnosis of gall-bladder disease, the authors believe that (1) the history and physical signs are of great importance and may occasionally justify operative therapy even in the presence of negative roentgenological and biliary tests, (2) a positive diagnosis of stone in the gall bladder can be made on the basis of negative shadows in cholecystography, or, in not more than half of the cases, by the presence of cholesterol crystals in biliary drainage material, (3) by means of either of these tests a diagnosis of gall-bladder disease can be made in approximately 90 per cent of the cases with stone and in 50 or 60 per cent of those without stone, but that a strict diagnostic classification on the basis of the presence or absence of stone is frequently impossible, and (4) both tests should be employed.

routinely in cases of suspected gall bladder disease as a check on information obtained from the history and physical examination of the patient. In some instances cholecystography and in other instances duodenal drainage will give important diagnostic aid. Together they failed to be of help in only 3 of the authors' cases.

EMIL C. ROBITZKE, M.D.

Bazzocchi G. Alterations of the Contractile Portion of the Gall Bladder Wall in Various Forms of Gall Bladder Disease (Alterazioni della parte contrattile della parete della colecisti in varie forme di coledocistopatia). *Ann. ital. di chir.* 1938 17 23

Bazzocchi examined 24 gall bladders presenting various forms of gall bladder disease and after discussing in detail the normal histological features of the gall bladder he studied the pathological alterations encountered in cholecystitis, cholelithiasis, and lipodosis.

He found that the fundamental features of lipodosis consist of hypertrophy and hyperplasia of the mucosal and muscular layers whereas in cholecystitis and cholelithiasis he encountered a marked sclerosis of the gall bladder wall.

In cases of gall bladder lipodosis, phenomena of dysfunction and dyskinesia predominate whereas in cases of cholecystitis and cholelithiasis inflammatory phenomena are apt to appear. Any combination of these two fundamental lesions may be encountered in the various forms of gall bladder disease.

Bazzocchi believes that hypertrophy and hyperplasia of the epithelial portion of the gall bladder wall must be considered as morphological expressions of its dysfunction. The sclerosis, on the other hand, causes an abolition of mobility and function of the gall bladder.

The reticular framework of the mucous membrane follows the same fate as that layer and becomes hyperplastic and hypertrophied in conditions of lipodosis whereas it undergoes a scleroreticular or collagenic metaplasia in inflammatory or necrotic conditions. The histopathological aspects of the elastic portion of the mucous membrane vary in the various forms of gall bladder disease.

The muscular layer undergoes the same changes as the mucous membrane and becomes hypertrophic in lipodosis and atrophic or fibrotic in inflammatory conditions. The argyrophilic reticulum of the muscular layer is divided into an interstitial and perimuscular portion. The interstitial layer follows largely the fate of the collagenic fibers whereas the perimuscular layer follows the fate of the smooth muscle cells. The elastic network is thickened if the collagenic fibers begin to show proliferative changes.

The subserosal layer presents features which are different from those encountered in the mucosa. It is soft and in gall bladders with a marked mucosal hyperplasia its volume is decreased. In gall bladders presenting a sclerosis and atrophy of the mucosa on the other hand the subserosal layer is thickened and infiltrated. The reticular network which normally is very scarce forms argentaffine ag-

gregations in all places where infiltrates are present. The elastic fibers which are normally quite abundant in the external layers increase in number especially in cases presenting a sclerosis or a pericholecystitis.

In general it may be stated that the contractile portion of the gall bladder is always altered in the conditions but the changes depend upon the individual type of gall bladder disease.

The author points out that in the contractile mechanism of the gall bladder the smooth muscle cell is of prime importance. Contrary to common belief in all forms of cholecystitis without jaundice the colic is not due to the possible presence of a stone nor to a hyperkinesia because of the fact that the contractile elements are almost completely destroyed. Also the severe pain is not due to hyperdistension of the gall bladder because the rigidity of its wall is considerably increased.

RICHARD F. SOMMA, M.D.

Åkerlund A. Progress in the Roentgenological Diagnosis of Gall Stones as a Result of Studies on the Conditions of Sedimentation and Stratification in the Gall Bladder (Die Verbesserung der Roentgenologischen Gallenstein diagnosis durch Untersuchung der Sedimentierung und Schichtungsverhältnisse in der Gallenblase). *Acta radiol.* 1938 19 23

As in the author's article in the *Acta Radiologica* in 1933 on this subject (abstracted in *Internat. Abstr. Surg.* 1933 57 128), he still adheres essentially to the technique and reiterates the thoughts of that time. He supplements the subject of clinical possibilities with a wealth of new material and experimental evidence which tends to substantiate his theory that biles of differing specific gravities are the cause of the phenomenon of stratification. Fractions of bile or even of plain water containing different dilutions of the contrast material (thorotrast) and gall stones in a fresh stage (i.e., not yet dry and porous and surrounded by mucus and composed of substances ranging all the way from the pure cholesterol (specific gravity 1040 to 1056) to the calcium stone of much higher specific gravity) were introduced into extirpated gall bladders, wax phantoms of gall bladders, and into living gall bladder and roentgenograms were taken under conditions simulating those of the clinic.

From his studies the author concludes that although the heavy bile containing contrast medium and the lighter native biles do not mix completely in the gall bladder there is no abrupt demarcation of the materials of different specific gravities being suspended at different level and he constructs a schema illustrating his findings (Fig. 1).

Added clinical material demonstrates the assertion that in every case in which gall stones are suspected the new method will either rule out their presence with greater certainty or, by the suspension on a line at a uniform level or by a half moon shaped sedimentation at the bottom of the gall bladder

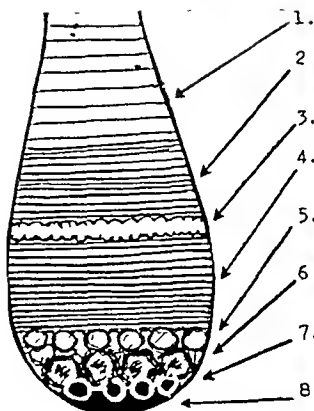


Fig 1



Fig 2



Fig 3

Fig 1 Schematic drawing combining all the different types of stratification and sedimentation in the gall bladder (1) native bile (bile containing no contrast material), (2) contrast bile (less highly concentrated), (3) suspended gall stones, (4) contrast bile (more highly concentrated), (5) concretions with small calcium content, (6) concretions with high calcium content, (7) completely calcified concretions, (8) amorphous calcium sediment

Fig 2 Fundus sediment with a half-moon-shaped agglomeration of tiny, transparent stones At the bottom

is seen a thin layer of amorphous calcium sediment (incipient "calcareous or limy bile")

Fig 3 So-called fundus-diverticulum or hour-glass gall bladder Horizontally suspended stratum, consisting of a large number of extremely small, cholesterol stones A few hours previously the suspended layer of stones lay entirely beneath the obliquely directed infolding of the gall-bladder wall (fundus diverticulum) The diagnosis of stone was only possible by means of the sedimentation roentgenogram

even of small transparent groups of stones, it will at times enable a diagnosis which could not otherwise have been made (Figs 2 and 3)

JOHN W BRENNAN, M D

Violet: The Surgical Treatment of Diabetes Mellitus, Its Basis and Possibilities (A propos du traitement chirurgical du diabète sucré, ses bases et ses possibilités) *Rev de chir*, Par, 1938, 57 54

The author reviews and evaluates the surgical procedures that apply to diabetes mellitus as reported in experiments on animals and in man. He believes that diabetes can be considered a disease of the regulatory mechanism of carbohydrate metabolism, and differentiates essential diabetes from symptomatic diabetes due to lesions of the pancreas, suprarenal glands, thyroid gland, parathyroid glands, hypophysis, or third ventricle. The fact is cited that in essential diabetes pancreatic lesions are rare and the insulin content of the gland is normal. Apparently the insulin present is not excreted in the blood because of lack either of endocrine or nervous stimulation. Attention is called to the fact that a depancreatized dog is not comparable to a human diabetic patient. This explains the conflicting results of animal and human experimentation, which are reviewed.

The possibility of surgical treatment of diabetes mellitus is based on the physiological classification of endocrine glands as hyperglycemic or hypoglycemic, and on our knowledge of the nervous regulation of carbohydrate metabolism. In order to increase the

secretion of insulin, attempts have been made to activate the pancreas, to activate the salivary glands, to perform a sympathectomy of the pancreatic arteries, and to make pancreatic grafts. As far as their application to human diabetes is concerned, these attempts have met with almost complete failure. In the effort to depress hyperglycemic factors the attack has centered on the suprarenal glands and the thyroid gland. Only in the case of splanchnic section have promising results been obtained, and the reports are not unanimous. The author attributes the benefit described to the suppression of occasional sudden discharges of adrenaline which cause hyperglycemia. He points out that the operation has not been performed many times and that it is not without danger, but concludes that it may prove of value in certain severe cases with arterial complications. If the diabetic symptoms are secondary as apparently they are in certain cases of gall stones, pancreatic stone, and hyperthyroidism, beneficial results may be obtained from surgery.

WALTER H NADLER, M D

Caldarera, E. Acute Abscess of the Spleen (L'ascesso acuto della milza) *Ann Ital di chir*, 1937, 16 953

After having briefly reviewed the literature concerning acute abscess of the spleen, a relatively rare lesion, Caldarera reports the case of a fifty-four-year-old woman whose past history was essentially negative. The patient was admitted to the hospital complaining of tenderness and pain in the left hypo-

chondriac region accompanied by chills and fever. The pain increasing progressively in intensity, radiated toward the lumbar region and also to the base of the corresponding side of the thorax. A tentative diagnosis of malaria was made and quinine was given, however this failed to bring relief.

On physical examination there appeared a considerable tumefaction of the upper left abdominal quadrant. A mass was felt extending from the costal arch to the level of the umbilicus downward and medially to the outer border of the left rectus muscle. Laterally the mass extended into the lumbar region. There was marked tenderness on pressure over this area accompanied by some degree of muscular rigidity.

In view of these findings a diagnosis of probable acute abscess of the spleen was made and the patient was laparotomized. After exposure of the greatly enlarged and adherent spleen an exploratory puncture was made which yielded a considerable quantity of purulent material.

The immediate postoperative condition was satisfactory and the patient made an uneventful recovery. Bacteriological examination of the purulent material removed at operation revealed the presence of colon bacilli in pure culture.

Concerning the pathogenesis of the condition the author believes that splenic abscess may be secondary to a splenic infarct, trauma, and splenic torsion and ectopy. The causative organisms are usually the common pyogens such as the staphylococcus, the streptococcus and the pneumococcus as well as bacillus coli and ameba histolytica.

Splenic abscess has been reported to occur as a sequel of a great variety of infectious conditions, such as furunculosis, otitis media, erysipelas, staphylococci, osteoperiostitis, osteomyelitis, purulent sal-

pingitis, appendicitis, gonorrhea, intestinal amebiasis, ulcerative endocarditis, pneumonia, typhoid and paratyphoid fever, puerperal infections, diphtheria, malaria, smallpox and bubonic plague. Most commonly typhoid fever produces splenic abscess.

The author also reports the results obtained from an experimental study performed with rabbits. He attempted to produce splenic abscess in one group of animals by traumatizing the spleen, whereas in another group of animals he produced an anemic infarct of the spleen by ligating the terminal branch of the splenic artery. Following the operation all the animals were inoculated intravenously with a broth culture of staphylococcus aureus. They all died within from two to seven days. It thus appears that splenic abscess may be produced artificially in animals when their spleens are rendered susceptible to infection either by trauma or by the production of an anemic infarct. The resulting lesions, however, are different in the traumatized spleens there appears within the injured zone an aggregation of small abscesses which gradually enlarges and becomes confluent. In the infarcted spleens, however, the inflammatory process begins around the infarcted area and the latter becomes gradually infiltrated and undergoes purulent changes.

The three cardinal clinical manifestations of acute splenic abscess are pain, fever, and splenomegaly, and the latter finding may confuse the diagnosis. The disease may begin suddenly or the onset may be insidious. Diagnosis is sometimes difficult and the condition is most commonly confused with malaria from which it is differentiated by the negative blood smears. X-ray examination may prove very helpful. The prognosis of untreated cases is grave. Treatment is always surgical. RICHARD E. SONNIA, M.D.

GYNECOLOGY

UTERUS

Ducuing, J.: The Geneva Classification of Cancers of the Cervix (Sur la classification des cancers du col "de Genève") *Acta radiol*, 1938, 19 13

In 1926 the "radiological subcommission for cancer" of the Society of Nations, charged with the study of radiotherapeutic results in cervical carcinoma, were well aware that to establish exact and comparable statistics it was necessary among other things to divide the epitheliomas of the cervix into different classes depending upon their anatomical extension. Their classification with some modifications and concessions was finally adopted by the Society even though well known imperfections did exist.

The classification though incomplete has offered a possibility of accurately defining the results of radiotherapy of cancer of the cervix; and it should be in the interest of every one to co-operate in the improvement of this classification.

It is very difficult to set up a classification that is without fault, if based on the development of cancer in 3 stages it is too crude to be of any use in the study of the therapeutic results, if based upon these results themselves it must necessarily be made afterward and would vary with the progress of the treatment. The stages or classes here proposed are essentially certain anatomical and clinical states clearly defined as to shape and extension and thus valid for all forms of radiation, both for the present and the future.

In the classification of Geneva the author criticizes (1) certain negative definitions, e.g., the placing in Stage III of all cases not falling into Classes II or IV, (2) the conception of mobility, which is difficult to define and difficult to relegate to its causative factor, infection or carcinoma, (3) certain faults with the subdivision within the different

classes or stages, e.g., cancers with adenopathy and discontinuous propagation are placed in Class III instead of Class IV, and (4) the want of precision in the definition of a certain case in a certain class—it seems to the author that it is necessary to state Class III (vagina), Class III (parametrium), Class IV (bladder), Class IV (rectum).

The following classification, presented by Ducuing himself, is also admittedly incomplete, but it is free of the criticisms just expressed.

A schematic representation of four stages of the author's classification of cancer of the cervix is herewith reproduced.

Class I The cancer is strictly limited to the cervix. Palpation reveals beyond a doubt that the parametrium and vaginal insertions are free.

Class II The cancer infiltrates the mucosa of the upper vagina, that is, the dome. Class II (vagina).

The cancer infiltrates the parametrium on one side or both without involving the pelvic wall. Class II (parametrium).

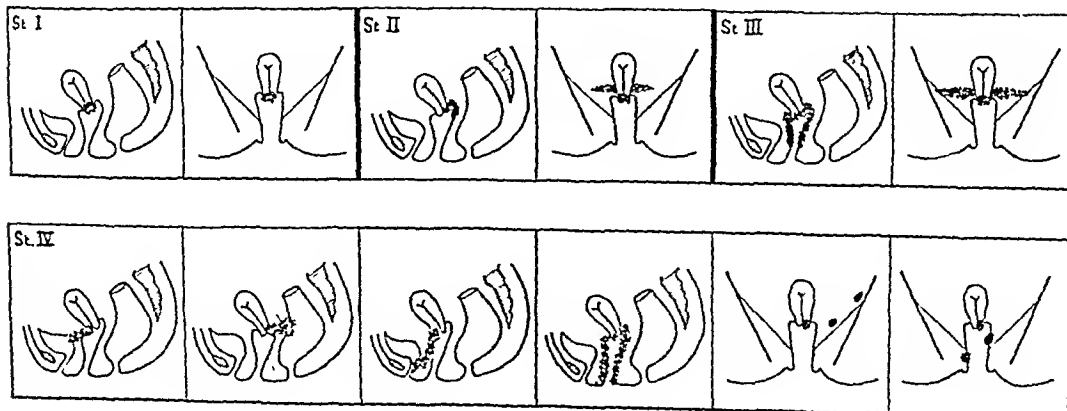
The cancer infiltrates the parametrium and the vagina under the preceding conditions. Class II (vagina-parametrium).

Class III The cancer infiltrates the vaginal mucosa, extending downward but not to involve the vulva. Class III (vagina).

The cancer infiltrates the parametrium and the pelvic wall of one or both sides. Rectal palpation reveals continuation from the cervix to the pelvic wall. Class III (parametrium).

Class IV The cancer infiltrates the bladder. Class IV (bladder).

The cancer infiltrates the rectum. Class IV (rectum).



The cancer infiltrates the urethra Class IV (urethra)

The cancer infiltrates the vulva Class IV (vulva)

There may also be extension into the pelvic ganglia or vaginal metastases which are separated from the primary lesion Class IV (ganglia) or Class IV (vaginal nodules)

Class V Metastases are present at a distance from the pelvis

GEORGE C. FINOLA, M.D.

Arneson, A. N. The Use of Interstitial Radiation in the Treatment of Primary and Recurrent Carcinoma of the Uterine Cervix. *Radiology* 1938 30 167

No single plan of irradiation is suitable for all patients with cervical cancer. If the percentage of cures is to be increased materially both the roentgen and radium treatment must be individualized for each patient. The author favors a preliminary course of x-ray treatment for most patients because it tends to reduce local infection and thus lessen the local reaction from radium at a later date and because the regression in the size of the growth facilitates the application of radium.

The present methods of applying radium to the uterus and vagina do not insure an adequate minimum dose nor a proper distribution throughout the tumor-bearing region. Portions of the growth at greater distances than 3 or 4 cm. from the cervical canal cannot be treated adequately without serious damage to intervening or neighboring normal structures. The parametrial dose can be increased without the administration of excessive amounts of radium from any one source if a greater number of sources are distributed throughout the tumor-bearing area. Interstitial radiation by the use of needles and seeds is the most logical means of accomplishing this. The work of Pitts and Waterman in which these authors reported marked improvement in results by the use of interstitial radiation is quoted. Twelve to sixteen platinum needles, each containing from 20 to 40 mgm. of radium, were used. These were distributed throughout the cervical and parametrial tissues. Doses up to 10,000 mgm. hr. were administered. The mortality was 25 per cent. No particular difficulty on account of infection was experienced.

The author discusses 4 cases in which needles were employed in the treatment of primary or recurrent carcinoma of the cervix. Roentgenographs illustrate the distribution of the different sources in each patient. At first steel needles, each containing 12.5 mgm. of radium, were used. Later a change was made to sheath needles containing from 1 to 5 or 6 mgm. each and with a wall thickness equivalent to 0.5 mm. of gold. The immediate reactions were quite favorable.

Emphasis is placed upon a predetermined plan of irradiation for each patient. This should take into

consideration that from 3 to 4 threshold doses are necessary for the control of the disease. Isodose charts have been prepared for radium which can be used in the same manner as depth dose charts for x-rays. The method of preparing the charts is described in detail. They present a fairly rapid method of determining amounts of irradiation required for delivering a predetermined tissue dose that is considered adequate for a given lesion. Of course the volume of tissue and its contours can be estimated only roughly and thus estimations of the tissue dose can be only approximate. However, such estimations insure individualization in treatment and proper distribution is at least approached.

DAVID L. G. MORTON, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Portes, Aschheim and Robey. Concerning the Differentiation of the Corpus Luteum of Pregnancy and of Menstruation (*Sulla differenziazione dei corpi jaunes gestatifs et menstruels*). *Gynäk. u. Obst.*, 1938 37 100

Although it has previously been affirmed that the corpus luteum of pregnancy and that of menstruation are identical, the authors contend that differential characteristics exist some of which are relative, others absolute. Macroscopically the corpus of pregnancy is larger and more deeply colored than that of menstruation. Histologically, there is a considerable difference in it in the early and late months of pregnancy, but in general the cells are larger and more irregular than in the corpus luteum of menstruation. Microchemically calcium salts occur in the corpus luteum of pregnancy, but there is some difference of opinion whether the fat content increases or decreases.

The presence of colloid in the corpus luteum seems to be absolute in the state of pregnancy. Colloid in the corpus luteum of pregnancy was first described by Rabl. Many observers since then have found colloid present during pregnancy and absent in menstruation. The authors report similar findings in a large group of cases of their own, using formalin fixation, paraffin embedding and staining with hematoxylin-eosin or iron hematoxylin. The Van Gieson stain, the latter staining colloid a yellowish brown. The colloid appears in the form of globules about the size of a red blood corpuscle at times in the protoplasm at times apparently extracellular. While the authors have found colloid present in the corpus luteum in every case of pregnancy, they have never found it present in the absence of pregnancy. They believe this is to be regarded as a secretion perhaps conditioned by the presence of gonadotropic hormones in the blood, perhaps regulated by the humoral diffusion of estrogenic bodies. They believe that the presence of colloid is so certain in pregnancy that it might be used in medicolegal diagnosis. Photomicrographs of colloid droplets in the corpus luteum of pregnancy accompany the article.

MAX M. ZINNBERG, M.D.

NORRIS, E. H. Arrhenoblastoma A Malignant Ovarian Tumor Associated with Endocrinological Effects. *Am J Cancer*, 1938, 32 1

The author reports the case of a patient who was followed up for more than four years and who finally died at the age of thirty-four. When she was first examined in January, 1933, her complaints included fatigue, nervousness, and generalized edema. It was found that she had a moderate hypertension. A short time later the hypertension was more marked, and glycosuria was discovered. These conditions improved under treatment, but later she became a psychopathic problem. Thorough examination at the Mayo Clinic revealed these pertinent findings.

There was a fine growth of hair on the upper lip, the back and chest were covered by pustules and comedones, the clitoris was not enlarged, there was edema of the face, a moderate hypertension persisted, there was mild secondary anemia, but the glycosuria could be controlled easily with insulin. No definite diagnosis was possible and she was placed under observation. Later, she lost all hair from her scalp and failed to menstruate. The edema of the face persisted and so did the evidence of mental disease. Eventually, a diagnosis of supra-renal cortical syndrome was made, and bilateral hyperplasia, rather than tumor, was suspected. The adrenals were explored in May, 1934, and no tumor was found. There was some postoperative improvement in the symptoms for a few months, after which the swelling returned to the face, neck, shoulders, and arms, this was a brawny edema which did not pit. A few months later she again became psychotic and finally insane. This required incarceration in an institution for mental diseases. At that time it was noted that she had an extensive growth of hair on the face and there was a dark pigmentation of the skin. In March, 1935, x-ray therapy was started over the thymic area, although films failed to reveal an abnormal mediastinal shadow. Her condition seemed to improve following this deep x-ray therapy and for almost two years her condition was more satisfactory, but hospitalization again became necessary because of pain in the right lower chest, nausea, and vomiting. An exploratory laparotomy revealed a greatly enlarged liver containing multiple tumor nodules and slight ascites. She died in April, 1937.

At autopsy the edema of the lower extremities and of the face was quite marked. A brownish pigmentation on the back of the hands and feet was noted as well as the growth of hair on the face. A large tumor mass was found in the central mediastinum, it partially surrounded the great vessels. There were a few tiny tumor nodules in both lungs. The liver weighed 5,500 grams and contained many tumor nodules. The adrenal glands showed irregularity of outline due to previous excision of tissue for biopsy, and in the left gland there were two small tumor nodules. The uterus was infantile in type. The right ovary contained a small (15 by 12 by 11 mm.) ovoid tumor nodule which protruded from the sur-

face. It was purple-gray in color in contrast to the ovarian tissue. The left ovary was normal except that it was firm, white in color, and had the general appearance of a gonad from an elderly woman. However, there were many follicles in the left ovary, some were atretic and others were in good condition. No gross lesions were found in the brain. The thyroid, three parathyroids, the hypophysis, and pineal body were also examined.

The ovarian tumor was made up of cords and hock-like masses of epithelial cells. These cords and masses were very irregular in size and shape and were separated by a fibrous connective stroma. The epithelium of the tumor showed no tendency to form follicles, tubules, or glandular structures. As compared with the primary tumor, the metastatic lesions in the liver, lungs, kidneys, left adrenal, left ovary, and mediastinum were more dense and the cells showed less tendency to be distributed loosely. The epithelial cells of the tumor had little cytoplasm, the nuclei were relatively large, irregular in outline, and, for the most part, hyperchromatic. In less dense parts the cytological arrangement simulated a loose syncytium. The uterine endometrium, breasts, and scalp tissues all showed atrophic changes.

Among the large variety of ovarian tumors, there are only two which seem regularly to be associated with endocrinological effects; they are the arrhenoblastoma and the granulosa-cell carcinoma.

The term arrhenoblastoma is used to designate a small group of malignant ovarian tumors in which, through the action of what is thought to be a hormone produced by the tumor, defeminizing or masculinizing effects become manifest in the host. Consequently, arrhenoblastoma refers to a clinicopathological condition. This term can rarely be used as more than a presumptive clinical diagnosis, and less commonly can it be employed for a diagnosis based solely on histological study. Thus far, the world's literature includes 38 cases, but critical analysis permits only 29 of them to pass more or less rigid combined clinical and morphological criteria for the diagnosis of arrhenoblastoma.

This lesion is more prevalent in the third and fourth decades of life, but the reported cases range between the sixteenth and sixty-sixth years.

One must differentiate between symptoms which arise from the loss of feminine qualities and symptoms which are due to the development of definite male characteristics.

The early syndrome of defeminization is a persistence of amenorrhea with sterility. The breasts and endometrium atrophy, and the genitalia, with the exception of the clitoris, are normal or somewhat hypoplastic.

In masculinization, some degree of hirsuties is an almost constant finding. There may be a mustache or a beard, or even a generalized growth of hair on the face. Distribution of hair over the pubis, the lower abdomen, and around the nipples is of the masculine type. An extensive acne is common and the skin tends to become rough and darker than

normal The facial expression is masculine because of the coarse features and bushy eyebrows The skeleton is heavy and there may be an inversion of the normal pelvis to shoulders ratio of the female In cases of long standing, the clitoris is hypertrophied

As to the general nature of the condition there is loss in weight of the patient, but at times there may be abnormal deposits of fat Nervous symptoms of a variable type are usual The psyche may be altered but the heterosexual libido may remain unchanged until late in the disease The pelvic tumor may be very large or very small, and there may be local pain and discomfort from the growing neoplasm or from its metastases

The Aschheim Zondek test is negative Hyperglycemia and glycosuria may appear and disappear as may also hypertension

In general the course of the disease is continuous and progressive On the other hand there may be an alternation of periods of symptomatic exacerbation and quiescence

Early surgical removal of the tumor is the indicated treatment The primary growth is unilateral Arrhenoblastoma is evidently radiosensitive and irradiation may be useful in the management of postoperative recurrences However radiotherapy should be employed in maximum doses smaller doses may have a stimulating effect on the neoplasm After removal of the tumor the normal female characteristics return in a most dramatic fashion As a matter of fact, normal pregnancy has followed operation in a number of the reported cases If there is a recurrence of the tumor remasculinization may occur

In a previously normal female the appearance of signs of defeminization and the development of outspoken masculine characteristics should certainly suggest arrhenoblastoma as a clinical possibility The early clinical recognition of this lesion will, however probably always be difficult In the differential diagnosis one must consider (1) pregnancy (2) postclimacterium, (3) tumor of the adrenal cortex (4) Cushing's syndrome (5) diabetes of bearded women and (6) degrees of masculinization which are sometimes found in the entire absence of ovarian pituitary or adrenal lesions

The case herein reported is apparently the first arrhenoblastoma to have run an uninterrupted course and to have come to autopsy after which a careful microscopic study was made of all organs

Regularly only one of the ovaries is involved by the tumor The opposite ovary is usually smaller than normal for the age of the patient Arrhenoblastoma is definitely a malignant tumor showing a tendency to invade and metastasize However the tumor tends to grow slowly recurrences and metastases appear late The primary tumor may attain huge proportions or it may be of inconspicuous size It may be solid or cystic

Robert Meyer has attempted to divide arrhenoblastomas into three distinct groups on the basis

of their histological structure viz adenoma tubulare testiculare, an atypical group and an intermediate group It is the author's opinion that these three groups cannot be recognized as separate and distinct morphological entities he prefers to look on arrhenoblastoma as a malignant ovarian tumor the morphological picture of which corresponds more or less to certain some, or all of the varying structural conditions found in the indifferent stage of the development of the sex gland There seems to be little direct evidence to support the theoretical conception that arrhenoblastoma springs from embryonic cell rests in the hilus region of the ovary apparently it may arise from any portion of the ovary It is doubtful if the pathologist can make more than a presumptive diagnosis of this tumor because pathological investigation has not yet progressed far enough to justify the final diagnosis of arrhenoblastoma without a knowledge of the presence of the characteristic clinical syndrome

That a primary ovarian tumor of such undifferentiated state and one which apparently corresponds to such an early genetic stage should regularly produce a potent male sex hormone is more than remarkable Speculation as to which cells are accountable for the secretion or as to whether the hormone is derived from a tumor which had its origin in some cell rest supposedly made up of male directed cells is valueless Some future investigators may attempt the isolation of the hormone from this tumor and demonstrate its physiological activity However the fact that the effects produced in the ovaries of parabiotic experimental animals are similar to those found in the non neogenetic ovaries of chimeric cases of arrhenoblastoma provides a strong argument that a substance is produced by the arrhenoblastoma which is either the male sex hormone or something very much like it

The physiological state that is present with an arrhenoblastoma is best explained on the basis of intersexuality Intersexuality is thought to find its explanation in disturbances or disharmonies of the endocrine glands It is interesting to note that the hypophysis from this case of arrhenoblastoma showed the same histological picture as that constant anatomical change associated with Cushing's syndrome In the adrenals there was marked hypertrophy of both the acidophil and pale cells of the cortex The thyroid was in an extremely quiescent state The pancreas including the islands of Langerhans was normal The thymus was absent The parathyroids and pineal body were normal

GEORGE H. GARDNER M.D.

EXTERNAL GENITALIA

Franché O The Treatment of Vesicovaginal
Fistulas (Le traitement des fistules vésico-
vaginales) J. d'urolog. méd. et chir. 1038 45 21
120 205

This is a comprehensive modern monograph on vesicovaginal fistula including a historical résumé of

surgical treatments and a presentation of modern techniques and results, including Marion's successful plastic reconstruction of the urethra in severe cases with sphincter paralysis. The author stresses the need for a decision of (1) the best operative procedures in the various vesicovaginal fistulas in which the sphincter is conserved, and (2) the best treatment when the urethral sphincter is not functioning. Historically, Marion Sims (1849) is given credit for successful treatment by means of the vaginal approach. In 188r Trendelenburg introduced the transvesical approach. In 1893 Dittel recommended the transperitoneal approach.

The author classifies the various surgical treatments of vesicovaginal fistula as follows:

CURATIVE METHODS

- 1 From below
 - a Vaginal approach (perineotomy),
 - b Vaginal approach, completed by parasacral, suprapubic, ischio-rectal, or uterine plastic
- 2 From above
 - a Extraperitoneal approach (transvesical operation of Marion and sub-peritoneal operation of Bardenhauer)
 - b Transperitoneal approach (operation of Dittel, 1893, and transperitoneovesical operation of Legueu, 1912)
- 3 Combined approach
 - a Peritoneovaginal operation of Pousson, Fritsch
 - b Transvesicovaginal operation of Marion

PALLIATIVE METHODS

- 1 Episiorraphy of Vidal de Cassis (1844)
- 2 Colpocleisis of Simon de Heidelberg (1861)
- 3 Vesicovaginal-rectal cloaca operation of Maisonneuve (185r)

DERIVATIVE METHODS

- 1 Cutaneous drainage of urine
 - a Cystostomy (Israel)
 - b Double ureterostomy (Bachrach)

- 2 Implantation of ureters
 - a In the intestine (Coffey)
 - b In a newly formed bladder (Gersuny, Heitz-Boyer, Hovelacque)

An important point in operative indications is the existence or destruction of the vesical sphincter.

Pre-operative care is stressed. Rubiazol is favored as a urinary disinfectant. A Pezzer sound is placed in the fistulous tract and kept there while the operative area is treated, cleansed, and disinfected. Pre-operative cystoscopy is also useful when practicable. It is advisable to remove the Pezzer sound several days before operation to give the tissues a chance to return to normal.

As to the time between the appearance of the fistula and operative treatment, authorities differ. One should permit the tissues a chance to return to normal conditions before surgery is attempted. Marion recommends a period of from six weeks to three months. The author then describes in detail with suitable illustrations the following operative procedures:

- 1 When the sphincter is functioning

Operations by the (1) vaginal route, (2) the transvesical route, (3) the transperitoneal route according to Dittel and Forgue, and (4) the transperitoneo-vesical route according to Legueu.
- 2 When the sphincter is injured
 - 1 Closure of the bladder with reconstruction of the urethra as practiced by Marion. The technical details of Marion's treatment are described in detail, and include the postoperative care and possible complications.

In all Marion has operated on 95 patients. Of these 24 were operated on by way of the vagina with 87.5 per cent success, 50 through the bladder with 96 per cent success, and 21 cases with reconstruction of the urethra with 90 per cent success. These latter used to be considered incurable.

This contribution is a very valuable and instructive monograph on a very important subject.

JACOB E. KLEIN, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Lambillon J An Experimental and Clinical Contribution to the Study of the Physiology of the Posterior Hypophysis during Pregnancy and Its Relation to the Eclampsy State (Contribution expérimentale et clinique à l'étude de la physiologie posthypophysaire de la grossesse et de ses rapports avec la gestose éclamptogène) *Rev belge d'ac méd* 1938 10 1

After making a study of the physiology of the posterior hypophysis during pregnancy the author draws the following conclusions

1 The normal pregnant woman after the first trimester appears particularly refractory to the intravenous injection of 3 units of tonephrine, the pressor fraction of pituitrin

2 The pre eclamptic patient presents on the contrary an exaggerated reactivity to the same injection much greater even than the normal non pregnant woman or than the post partum patient

3 The nephritic pregnant woman reacts in the same manner as the normal

4 In the case of a dead fetus or incomplete abortion the woman remains insensible to the injection as long as the placenta remains viable after expulsion or curettage she reacts as the normal delivered woman This suggests that the placenta plays an important rôle in elaboration of the factor inhibiting the posterior hypophysis during pregnancy

PAUL STARR M D

McGowan J M Baker J O Torrie A M and Lees J Vomiting of Pregnancy A Part of the Mechanism of Production and a Method for Its Relief *J Am M Ass*, 1938 110 408

Because of the close relationship between pregnancy and the origin of biliary disease and because spasm of the second portion of the duodenum produced by morphine was accompanied in some cases by nausea or biliary colic the authors made a study of the duodenum in patients suffering from the vomiting of pregnancy

Foetiological studies were made in the cases of two women A spasm of the second portion of the duodenum was noted in each case

Twelve consecutive patients who suffered from the vomiting of pregnancy were treated with glyceryl trinitrate (nitroglycerin) 0.02 gr or 0.0006 gm being placed under the tongue before or after meals In these cases the condition was more severe than usual All the patients had had morning sickness which progressed to severe vomiting Five of them required hospitalization It was only after the customary methods had failed that treatment with glyceryl trinitrate was started The results were uniformly good All patients ceased vomiting within two days of the onset of treatment one patient did

not vomit once after the drug was used. It was found that by the administration of the drug ten minutes before meals, more complete relief of the nausea was obtained than when it was administered after meals No untoward effects except a transient headache of a few minutes duration were noted The patients were advised to remain in the prone position for ten minutes after the tablet was placed under the tongue

CHARLES BARON M D

Alberti P Clinical Research on the Pathogenesis of Pyelitis of Pregnancy (Ricerche cliniche sulla patogenesi della pielite gravidica) *Riv ital di ginec* 1937 20 613

In the pathogenesis of pyelitis of pregnancy urinary stasis in the ureter is the essential factor Sfameni advanced the theory some time ago that a state of contraction and de-contraction of the urinary apparatus is produced by the hormones of pregnancy elaborated by the ovary the placenta and the fetus Bompini has recently demonstrated that urine from gravid women up until four or five months of pregnancy, contains hormones which stimulate ureteral muscle tone and contraction at seven months the hormones in the urine exhibit a paralytic action on the ureteral muscles and as labor approaches an activating action of the hormones recurs

The author believes that these results are clinically confirmed by the 46 cases of pyelitis of pregnancy collected at the Obstetrical Clinic of Iams from 1929 to 1936 Twenty nine of the 46 cases approximately two third occurred at the seventh month of pregnancy 4 occurred before the fifth month and only 1 after the eighth month

The author could not concur with Sfameni that the sex of the fetus is a factor in the pathogenesis of pyelitis of pregnancy since 66.6 per cent of his patients gave birth to males and 33.3 per cent to females as against 56 per cent females and 44 per cent males in Sfameni's series

GEORGE C FIVOLA M D

Bendandi G The Gall Bladder the Female Genital Organs Cholecystitis and Pregnancy (Colecistite e apparato genitale femminile Colecistite e gravidanza) *Riv ital di ginec* 1937 20 517

A clinical and experimental review of the literature on the influence of pregnancy and the genital function on gall bladder disease is followed by an exhaustive clinicostatistical report on 1,000 cases of cholecystitis collected at the Surgical Clinic of Bologna from 1921 to 1937 Of the 1,000 patients 67.4 per cent had stones and 32.6 per cent had lithiasis 90.5 per cent were females and 9.5 per cent were males Eighty five and nine tenths per cent of the 905 females had had one or more pregnancies, while 12.9 per cent were nulliparous Of the 610 women

with stones in the gall bladder 8.03 per cent had never been pregnant, whereas 90.49 per cent had had deliveries one or more times. In approximately 20 per cent of the cases the first clinical symptoms of the disease occurred during pregnancy, the puerperium, or soon afterward. The author believes that the data of this statistical study confirms the evidence in the literature that there is a certain influence of gestation on gall-bladder disease, and especially those gall-bladder infections with stones.

GEORGE C. FINOLA, M.D.

LABOR AND ITS COMPLICATIONS

Confiantini, M.: Uterine Tone during Labor and Its relation to the Sympathetic Nervous System (Il tono uterino in travaglio di parto in rapporto al sistema neuro-vegetativo) *Riv. Ital. di ginec.*, 1937, 20: 660.

The author reviews the literature on uterine tone during labor and then reports his experimental results with the hystrograph method of Fry on the tone of the uterine corpus and the lower uterine segment during the 3 stages of labor and the puerperium. In addition, all excitability reflexes, such as those shown by the pupils, pain, nasolacrimal region, skin, pilomotor and vagus nerves, and the tonus state of the body, trophic function, secretory function (perspiration and sebum), cardiovascular function, heart and vascular rhythm, thermal function, and arterial pressure were recorded, as well as their pharmacodynamic response to atropine, adrenaline, and pilocarpine.

Tabulated results are presented on 110 patients, 82 of whom had normal deliveries and 28 had operative deliveries.

Combining the results of his findings, the author was able to show that with normal delivery 45.25 per cent of the series had a reaction chiefly in the sympathetic nervous system, and 32.50 per cent chiefly in the vagus nerve, and in 23.25 per cent the two components of the autonomic system were in equilibrium. In the operative delivery group 57.14 per cent were vagotonic, 21.42 per cent sympathetico-tonic, and an equal number were normal.

In the women with a sympathetic reaction the tonicity of the corpus uteri gave values much higher than those of the lower uterine segment. In the women with a vagus reaction the tonus state of the corpus was less than that of the lower uterine segment. In those with equilibrium of the autonomic system the tonus of the corpus prevailed.

Parturition was found to be more rapid when the sympathetic nervous system was inclined toward sympathetico-tonia or normal, and slower in those patients in whom the vagus reaction predominated. In 57.14 per cent of the operative series the latter prevailed. A greater state of tonus in the corpus uteri than in the lower uterine segment also favored a rapid labor in these patients, with the reverse, labor was found to be prolonged.

GEORGE C. FINOLA, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Moudry, J.: Cerebral Hemorrhage and Hemiplegia in the Puerperium (Hirnblutung und Hemiplegie im Wochenbett) *Časop. lékař. česk.*, 1937, p. 1335.

The author reports 2 cases of puerperal hemiplegia which were observed during the last five years in the Second Gynecological Clinic.

In the first case the patient was a thirty-eight-year-old para-iv, who complained of headache. A right hemiplegia with motor aphasia occurred in the seventh month, due to a cerebral hemorrhage. The condition improved in several days, and all the symptoms disappeared after three weeks. The Bordet-Wassermann reaction was strongly positive, and anti-luetic treatment was instituted. Delivery took place three weeks before term, and its course was entirely normal.

In the second case, the patient was forty-three years old, a para-v, who was totally disoriented on admittance, with flexion contracture of the right upper extremity and spastic extension contracture of the right lower limb. The blood pressure was 120/60. The urine was negative for albumin and sugar. Inasmuch as the membranes had ruptured, and since no internal examinations had been made, metureusis was done and metralgin-quinn suppositories were introduced. After three and three-quarters hours, a full-term child was delivered, and the placenta ten minutes later. The neurological diagnosis was motor and sensory aphasia and right hemiplegia due to luetic endarteritis obliterans. The serological reaction was positive. The patient was discharged in an improved condition, after five weeks, to further home care. The following history was obtained from the relatives and attending physicians.

The first 2 pregnancies and deliveries were entirely normal, the third pregnancy terminated with the abortion of a macerated fetus in the fifth month, fifteen years ago. The course of the fourth pregnancy was entirely normal until the third month. Later, headaches and attacks of unconsciousness with generalized weakness occurred. In the fourth month the abortion of a macerated fetus occurred. After the abortion, the condition of the patient improved but three weeks later she developed unconsciousness, aphasia, and paralysis of the right side. In the present, or fifth pregnancy, headaches, vomiting, and attacks of unconsciousness again occurred in the seventh month. The apoplectic attack followed a week later. She was kept in this condition at home until her admission to the hospital.

Characteristic for both cases was the luetic etiology of the hemiplegia during pregnancy, and the rapid recovery with anti-luetic treatment, as has also been described in the cases of Arilazza, Miljan, Bonnet, and Renand.

Duhot divides puerperal hemiplegias into two groups. One group comprises hemiplegias which complicate pregnancy or delivery, but which are caused by a variety of diseases. In the second group

are cases of hemiplegia in which the most frequent cause is thrombosis or embolism following puerperal infection. A more practical division is one which separates the hemiplegias which are independent of the pregnancy from the true puerperal hemiplegias. The most frequent cause of typical puerperal hemiplegia is circumscribed cerebral hemorrhage and less often thrombosis or embolism of the cerebral vessels. The causes of transitory hemiplegias are localized cerebral edema, spasm of the cerebral vessels, and toxic injury of the brain substance. Cerebral hemorrhage in toxemias of pregnancy are due to the damaged blood vessels, increased blood volumes, elevated blood pressure and the colloidal blood changes. The delivery itself constitutes a mechanical factor, as in a case of Wolterck and Henriot.

In this group must also be included those cases with primary damage of the blood vessels or sclerosis. In the toxemias of pregnancy or eclampsia the hemiplegias occur during the second half of pregnancy (Galla's case). Non eclamptic apoplexies usually occur during the second stage of labor. As a rule there are extensive hemorrhages which lead to rapid death. Hemorrhages during pregnancy are much rarer. Their course is usually favorable. The symptoms and progress are to be interpreted in terms of the localization and extent of the hemorrhage, the phase during which it occurred and the cause of the attack. The apoplexy has no effect upon the child and it is not necessary to interrupt the pregnancy. With severe hemorrhage and a viable child the question of cesarean section must be con-

sidered. In apoplexy during delivery the most rapid and careful termination is indicated.

Although cardiac weakness plays an important rôle in thrombosis the vascular changes of pregnancy and the trauma of labor must not be disregarded. Thrombosis may injure the brain substance, veins and cerebral cortex. Arterial thrombi are rare and are usually of luetic origin. Pareses due to thromboses do not develop as rapidly as those following hemorrhage or embolism. If localized areas of cerebral cortex are destroyed by embolism the paralyses are often limited to monoplegias. In embolism during pregnancy or delivery no intervention is necessary except in moribund cases in which cesarean section may be indicated for the sake of the child. From all the cases yet known it appears that most instances of puerperal hemiplegia are due to cerebral hemorrhage in toxemias of pregnancy and fewer result from cerebral thromboses or emboli during pelvic infections. The smallest group of cases are those caused by various intercurrent diseased states of the cardiovascular apparatus.

Of the 56 described cases 50 per cent were fatal, 30 per cent showed improvement and 60 per cent presented complete recovery. Puerperal hemiplegias in the course of cardiovascular disease are most often associated with luetic endarteritis. The occurrence of the cerebral complications during the second half of pregnancy in these conditions indicates that the changes of pregnancy and delivery are contributory and not primary causes.

(ИДОКОВИЧ) LEO M. ZHODERMAN, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Vintici, V., and Theodorescu, I.: Latent Hydronephrosis (Les hydronéphroses latentes) *J d'urolog méd et chir*, 1938, 45 143

This is a clinical study on latent hydronephrosis, which is frequently mis-diagnosed. The authors describe latent hydronephrosis as a condition in which a pyelorenal dilatation of considerable volume occurs without apparent clinico-urological signs and is revealed only by the occurrence of a complication or various bizarre clinical syndromes. Maire of Lyon in 1938 wrote on the gastro-intestinal manifestations of latent hydronephrosis. In 1928 Holmann reported 4 cases of latent hydronephrosis the first presented with symptoms of intestinal occlusion, the second as a hematuria and a diagnosis of renal neoplasm was made, in a third there was a huge kidney without clinical signs, and in the fourth the hydronephrotic sac ruptured without any previous urinary symptoms. MacMynn in 449 autopsies on children under ten years of age found in 10 cases a ureteral dilatation with hydronephrosis, unilateral or bilateral. The condition had been overlooked during life in 50 per cent of the cases. Rowlands reported 5 cases of hydronephrosis which in life presented the signs of a cholecystitis or an appendicitis. Gauthier and Clavel have reported on latent hydronephrosis with gastro-intestinal signs. They classify the "gastro-intestinal" forms of hydronephrosis as follows

- 1 Chronic syndrome
 - a A dyspeptic form which simulates gastric or pyloric tumor
 - b An enteric form which simulates mucomembranous enteritis
 - c A form of "chronic appendicitis" which is encountered most frequently
- 2 Acute abdominal syndromes in which the hydronephrosis can simulate intestinal occlusion or peritonitis

In 1935 Charles Howze assembled 32 cases from the literature of the past twenty-five years. The diagnosis had been made in 18 cases only, in 5 a diagnosis of ovarian cyst had been made. In 1 case hydatid cyst of the liver was suspected. In another the diagnosis was bacillary peritonitis and in still another, retroperitoneal cyst. It is readily seen that latent hydronephrosis is not a well known condition.

The author reports briefly his own 4 cases, and presents excellent pyelograms as illustrations. He notes that the pathogenesis of hydronephrosis is a controversial question, but in his own cases a congenital origin seemed most likely. A congenital stenosis of the ureter may induce a progressive latent hydronephrosis until there is a complete destruction of renal function. In 2 of the cases there was a faulty implantation of the ureter, in a third there was a bilateral ureteropyelorenal dilatation without

a vesico-ureteral reflux. In the fourth case there was a voluminous, latent congenital hydronephrosis, secondarily infected with the bacillus coli.

The latency of the symptoms is explained by a tendency toward relaxation on the part of the muscular fibers with a resulting gradual slow symptomless dilatation of the urinary tract. Such voluminous hydronephrotic sacs are brought to attention accidentally because of secondary infection or variable urinary or digestive symptoms.

As concerns the symptoms, most of these congenital pyelorenal dilatations develop without clinical manifestations for a long time. Besides the aforementioned gastro-intestinal symptoms the authors point out a urethrostato-vesical syndrome without renal signs, with clear urine or a mild pyuria. Sometimes there is a nocturnal or diurnal pollakiuria. Again there may be a persistent pyuria.

For diagnosis chromocystoscopy with indigo-carmin indicates a poorly functioning kidney. The blood nitrogen is normal but the phenolsulfonphthalein is diminished. This triad of symptoms, renal deficiency on chromocystoscopy, diminution in the elimination of phenolsulfonphthalein, and normal blood nitrogen establishes the diagnosis of pyelorenal dilatation. This diagnosis is confirmed by pyelography and urography. For ascending pyelography the authors use 10 per cent sodium iodide.

The evolution of the hydronephrosis may take a long time. It may be found only at autopsy, not having been diagnosed during life. The complications of hydronephrosis are infection, and rupture of the hydronephrotic sac. The former is most frequent. Infection leads rapidly to sclerosis and functional destruction of the kidney. Rupture of the sac may occur from trauma or after exploration. The clinical symptoms in this instance are those of peritonitis or some other abdominal syndrome. Thus the existence of latent hydronephrosis may be important from a medicolegal standpoint.

Conservative surgery is usually favored in the treatment. This includes various plastic operations and transrenal drainage. Nephrostomy produces considerable improvement in the general health and considerable diminution of the renal sac. Renal drainage cures stasis and inhibits infection.

JACOB E. KLIN, M.D.

Ciceri, C.: Hydronephrosis Due to Anomalous Blood Vessels (Contributo allo studio della idronefrosi da vaso anomalo) *Arch ital di urol*, 1938, 15 1

Anomalies of the vessels in the renal pedicle have been known for a long time, but in recent years they have received considerable attention as a cause of hydronephrosis. Anomalous vessels in the renal pedicle are a result of embryonic development.

As to the pathogenesis of hydronephrosis one theory states that there is a stasis of urine in the

pelvis of the kidney as a result of pressure from an anomalous blood vessel. In addition to the pressure from this vessel a valvular compression of the ureter against the wall of the renal pelvis occurs. Some authors also assume the presence of a concomitant inflammation in the wall of the renal pelvis. Form reported 5 cases in which he found inflammation of the pelvis calyces and the cortical and medullary substance. He thinks that inflammation is not the effect but the cause of the hydronephrosis. He believes that the remittent hydronephrosis is due to an inflammation of the renal pelvis and ureter, and secondary inflammation of the kidney. Marion is convinced that ptosis exerts an important influence in the pathogenesis of hydronephrosis, especially when the ureter is fixed by anomalous vessels.

A second theory asserts that the determining cause of hydronephrosis is a congenital alteration of the wall of the pelvis and the ureter and that the anomalous vessels are of secondary importance. Also Bard recently has affirmed that hydronephrosis is secondary to a true disease of the tissues which constitute the walls of the pelvis.

A third theory supported especially by Israel Fedoroff and Legueu attributes great importance to dyskinesia of the pelvis as a result of which there is a disturbance in function of the musculature of the pelvis. According to Legueu a chronic stage of muscular retardation is followed by a progressive dilatation of the pelvis which may be followed by an acute attack characterized by muscular spasm. The latter reaction is followed by a complete lack of pelvic contractions with atony dilatation and complete urinary retention. Even in the pathogenesis of this dynamic form the presence of an anomalous vessel can have considerable importance as a source of irritation which disturbs the normal function of the musculature of the renal pelvis.

The author has studied 12 cases of hydronephrosis with anomalous vessels: 2 were in males and 10 in females. One case occurred in the first decade of life, 1 case in the second, 6 cases in the third and 4 in the fourth decade.

The clinical symptoms presented the classical features of intermittent hydronephrosis, namely, pains in the lumbar region, followed by a considerable excretion of very pale urine. Only 2 of the patients had hematuria.

Clinical examination in all of the patients revealed the existence of a renal ptosis. During a colic these patients showed abdominal rigidity and pain on pressure over the upper ureter on lumbar percussion and on renal palpation. In every case endoscopic and radiologic examination completed the diagnosis.

In all the cases which were operated upon the kidney was found to be ptosed and in some it was fixed in an abnormal position by perinephritis. The author observed various degrees of dilatation of the pelvis and calyces and the ureter was dilated at the point where the anomalous vessel encroached on it. In 3 cases the pelvic dilatation was most marked. The author examined histologically fragments of

kidney removed at operation and found dilatation of the glomerular spaces and uriferous tubules, lymphocytic infiltration about the blood vessels and slight hyperplasia of the interstitial connective tissue. The blood vessels which were examined were normal. No doubt the renal changes depended entirely on the gravity, duration and frequency of the urinary crises in the pelvis. Experimentally it has been demonstrated that after a urinary stasis of twenty days the kidney cannot recover its normal anatomical and functional characteristics. In fact the functional and anatomical changes in the kidney and pelvis were most severe when the occlusion of the ureter had been most prolonged and frequent.

Surgical therapy of this type of hydronephrosis may be classed as conservative, partially conservative and radical. Conservative treatment consists of ureteral catheterization, nephrostomy or pyelotomy. Resection of the constricting blood vessel is not favored by most authors because it may lead to parenchymal necrosis of the kidney. In advanced cases nephrectomy is advised.

In the author's cases section of the anomalous vessel was practiced together with nephropexy and severance of the perirenal and periureteral adhesions. Good results were obtained. It was not found necessary to do plastic operations on the pelvis or ureter.

JACOB E. KLEIN, M.D.

Smith G. G. The Surgery of Renal Tumors. *J. Urol.* 1935 39 305.

In a consideration of the operability of renal tumor multiple metastases are important. A single metastasis may be disregarded if it is amenable to irradiation or if in an extremity to amputation. Anemia and cachexia may preclude operation. The size and fixity of the tumor do not necessarily contraindicate operation; pre-operative radiation may reduce the size of the tumor to within the limits of operability. Size alone is not an insurmountable obstacle.

The surgeon should learn as much as possible about the characteristics of the tumor and the patient's condition before the operation. A retrograde pyelogram will indicate whether the tumor is of the cortical or pelvic type. Roentgenography of the intestine may show invasion of the latter. The function of the other kidney should be ascertained. Pre-operative radiation should be reserved for tumors which because of their size or fixity appear to be unusually difficult to remove. There is still considerable difference of opinion as to its true value.

Either the lumbar or the transperitoneal incision may be used. The author has used both an equal number of times. Indications for the lumbar route are: (1) uncertain diagnosis, (2) small size of the mass and (3) the probability that the growth is of the pelvic rather than the cortical type. Large cortical tumors are removed transperitoneally. Removal of the eleventh and twelfth ribs, as well as the extension of the lower end of the incision transversely across the abdomen enlarges the operative field. Various incisions are employed for the transper-

toneal operation The author uses the Cabot incision extending from the anterior edge of the erector muscles in the costovertebral angle inward and slightly downward to the midline just above the umbilicus, then carried upward in the midline to the ensiform process Upon walling the intestines away from the upper abdomen, the tumor can be exposed through an incision of the overlying peritoneum, or through an incision of the parietal peritoneum an inch outside of the colon, which is then rolled inward with the posterior peritoneum and exposes the renal fossa

Removal of the kidney should not be begun unless the appraisal of the situation has led the surgeon to believe that he can complete the nephrectomy The renal pedicle is isolated and ligated, and the kidney is removed, together with the surrounding fat The peritoneum is then sutured in place, and the renal fossa drained through a stab wound in the flank This description applies almost entirely to cortical tumors

With tumors of the renal pelvis, removal of the entire ureter together with the portion of the bladder through which the ureter passes is important In 6 of 7 of the author's patients with ureteral growths, there was a tumor either in the intramural portion of the ureter, or arising from the ureteral meatus Removal of the lower segment may be done at once or deferred for a second operation The author uses a midline suprapubic incision, stripping the peritoneum from the pelvic wall and pulling down the upper end of the lower segment of ureter The bladder is opened along a line parallel to the course of the ureter, 3 cm above the latter The bladder incision is carried down almost to the bladder outlet, the lower edge of this incision is grasped with forceps, drawn outward, and a second incision is made mesial to the ureteric ridge The mesial incision should begin and end at the ends of the first incision, so that an elliptical segment of the bladder base is removed The vesical opening is then closed and a catheter is left in the urethra This operation is indicated particularly in papillary carcinoma of the renal pelvis The bladders of such patients should be examined for tumor transplants every three months for two years, and after that every six months

The complications which may be encountered during nephrectomy for tumor are invasion of the colon, extension into the renal vein and vena cava, involvement of the duodenum with resultant tear into that viscus, injury to the vena cava, and accidental opening of the pleura

It is difficult to estimate the end-results of nephrectomy for renal tumors Recurrences have been reported as late as fifteen years after operation We must be very cautious, therefore, in referring to patients as "cured" Non-papillary tumors of the renal pelvis are the most certain to be fatal Papillary tumors of the pelvis show a better prognosis, but bladder transplants may develop

LOUIS NEUWELT, M D

Rusche, G, and Bacon, S. K Primary Ureteral Neoplasms *J Urol*, 1938, 39 319

Primary tumors of the ureter, whether benign or malignant, are comparatively rare lesions, if we judge by the fact that less than 100 cases have been reported in the literature Snyder and Wood (1933) found only 1 case in the records of the Massachusetts General Hospital and Colston (1934) stated that the records of the Brady Urological Institute of the Johns Hopkins Hospital, comprising over 22,000 cases, contained only 3 instances of primary tumor of the ureter Within recent years the condition has been reported with greater frequency than formerly, probably because there are now more definite methods of diagnosis, many of the early cases were autopsy findings, moreover, the possibility of their occurrence as independent entities in the urinary tract is now better known

Two cases of primary ureteral tumor, one benign and the other malignant, are reported and their clinical histories given In each of these cases the presence of the tumor was diagnosed pre-operatively by means of pyelo-ureterograms A simplified method of obtaining pyelo-ureterograms is described, and it is suggested that this is an improvement in diagnostic procedure which will enable the only pathognomonic sign of ureteral tumor, the filling defect, to be obtained with less difficulty than formerly The literature of primary tumors of the ureter is reviewed



Fig 1 First attempt at pyelo-ureterography, which was unsatisfactory A ureteral lesion is suggested

pelvis of the kidney as a result of pressure from an anomalous blood vessel. In addition to the pressure from the vessel a valvular compression of the ureter against the wall of the renal pelvis occurs. Some authors also assume the presence of a concomitant inflammation in the wall of the renal pelvis. Form reported 4 cases in which he found inflammation of the pelvis calyces and the cortical and medullary substance. He thinks that inflammation is not the effect but the cause of the hydronephrosis. He believes that remittent hydronephrosis is due to an inflammation of the renal pelvis and ureter and secondary inflammation of the kidney. Marton is convinced that ptosis exerts an important influence in the pathogenesis of hydronephrosis especially when the ureter is fixed by anomalous vessels.

A second theory asserts that the determining cause of hydronephrosis is a congenital alteration of the wall of the pelvis and the ureter, and that the anomalous vessels are of secondary importance. Also Bard recently has affirmed that hydronephrosis is secondary to a true disease of the tissues which contract the walls of the pelvis.

A third theory supported especially by Israel Fedoroff and Legueu attribute great importance to dyskinetia of the pelvis as a result of which there is a disturbance in function of the musculature of the pelvis. According to Legueu a chronic stage of muscular retardation is followed by a progressive dilatation of the pelvis which may be followed by an acute attack characterized by muscular pain. The latter reaction is followed by a complete lack of pelvic contractions with atony, dilatation, and complete urinary retention. Even in the pathogenesis of this dynamic form the presence of an anomalous vessel can have considerable importance as a source of irritation which disturbs the normal function of the musculature of the renal pelvis.

The author has studied 12 cases of hydronephrosis with anomalous vessels: 2 were in males and 10 in females. One case occurred in the first decade of life, 1 case in the second, 6 cases in the third and 4 in the fourth decade.

The clinical symptoms presented the classical features of intermittent hydronephrosis, namely pains in the lumbar region followed by a considerable excretion of very pale urine. Only 2 of the patients had hematuria.

Clinical examination in all of the patients revealed the existence of a renal ptosis. During a colic these patients showed abdominal rigidity and pain on pressure over the upper ureter, on lumbar percussion and on renal palpation. In every case endoscopic and radiologic examination completed the diagnosis.

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LOUIS NEUWELT, M D

Rusche, C., and Bacon, S K. Primary Ureteral Neoplasms. *J Urol*, 1938, 39 319

Primary tumors of the ureter, whether benign or malignant, are comparatively rare lesions, if we judge by the fact that less than 100 cases have been reported in the literature. Snyder and Wood (1933) found only 1 case in the records of the Massachusetts General Hospital and Colston (1934) stated that the records of the Brady Urological Institute of the Johns Hopkins Hospital, comprising over 22,000 cases, contained only 3 instances of primary tumor of the ureter. Within recent years the condition has been reported with greater frequency than formerly, probably because there are now more definite methods of diagnosis, many of the early cases were autopsy findings, moreover, the possibility of their occurrence as independent entities in the urinary tract is now better known.

Two cases of primary ureteral tumor, one benign and the other malignant, are reported and their clinical histories given. In each of these cases the presence of the tumor was diagnosed pre-operatively by means of pyelo-ureterograms. A simplified method of obtaining pyelo-ureterograms is described, and it is suggested that this is an improvement in diagnostic procedure which will enable the only pathognomonic sign of ureteral tumor, the filling defect, to be obtained with less difficulty than formerly. The literature of primary tumors of the ureter is reviewed.



Fig 1 First attempt at pyelo-ureterography, which was unsatisfactory. A ureteral lesion is suggested.



Fig. 2. Satisfactory right pyelo-ureterogram made three weeks later. Catheter was withdrawn by degrees. The illustration shows a hydro-ureter rapidly developing hydronephrosis (three weeks) and a filling defect in the lower third of the ureter. The diagnosis of ureteral tumor was definitely established.

For clinical purposes the distinction between benign and malignant tumors of the ureter at least in regard to papillary tumors is to a great extent arbitrary. The great majority of these tumors are papillomas which as is well known are potentially malignant and, as a matter of fact in course of time actually become malignant. Swift Joly states that of 133 ureteral tumors recorded 101 were papillary of 61 cases of primary malignant tumors of the ureter admitted as acceptable by Scott, 36 were papillary. In most of the reported cases of benign papillary tumors of the ureter the growth would probably have become malignant in the course of time. Squamous carcinoma and medullary carcinoma are rare.

In the literature the arbitrary division into benign and malignant tumors has generally been followed. The number of reported cases of primary tumors of both types varies according to the views of different authors regarding what constitutes an acceptable case. The criterion is to be certain that the growth in the ureter is not secondary to a primary growth elsewhere in the genito-urinary tract or a metastasis from some outside growth. Such a criterion is usually established by the pathological examination following operation or autopsy.

With the 2 cases now reported there is a total of 136 cases of primary ureteral neoplasm, 40 benign and 96 malignant supported by adequate histological proof in the literature up to the end of 1936. A few cases not sufficiently supported by histological proof have been omitted.

The only points that seem to call for discussion are the diagnosis, the etiopathogenesis of the growths and the treatment. There are certain signs which are presumptive evidence such as the obtaining of clear urine from the kidney pelvis when ureteral calculi and traumatic structure can be ruled out and there is constant or intermittent hematuria. The obtaining of fresh pure blood through the ureteral orifice or the presence of an obstruction to the catheter in the ureter is a very valuable sign. Smith remarks that when bleeding from the kidney the jet is vigorous and full but when from ureteral growths it is likely to be continuous, thick and tarry. This of course refers to the bleeding of hematuria, not that from instrumental manipulation. The only positive pathognomonic sign of a ureteral tumor is the demonstration of a filling defect. However the clinical difficulty of demonstrating such a filling defect either by intravenous or retrograde pyelography, is very great. In comments on their own case the authors have discussed an improvement in the diagnostic procedure. Regarding the nature and causation of ureteral growths they classify them into epithelial and non-epithelial types, the latter arising from structures other than the ureteral mucosa. The epithelial tumors may be divided into papillomas, papillary cancer and non-papillary cancer, the latter comprising about 41 per cent of ureteral malignant neoplasms.

The literature gives very little information as to the origin of papillary growths. Some consider that papillomas are not strictly tumors but only hyperplasias of the mucosa. The cause is variously ascribed to leukoplakia, mechanical irritation by calculi and inflammatory irritation. One cannot but surmise that if lithiasis is a cause of tumor the latter would be observed much more frequently. The occurrence of embryonal cell rest in the ureter as elsewhere has been suggested as a cause of tumor but this is more probable in the case of non-papillary tumors.

With regard to the method of operative treatment of malignant tumors there appears to be no question concerning the advisability of complete ureteronephrectomy either in one or two stages according to the patient's condition. With regard to the treatment of benign tumors especially of the papillary type ureteronephrectomy, although an extensive and very shocking procedure, probably offers the greatest degree of safety to the patient and should be the method of choice when a tumor is definitely diagnosed. (TRAVERS STERITA M.D.)

GENITAL ORGANS

De Azavedo S. Clinical Observations of the Seminal Vesicles and the Seminal Ducts after Catheterization of the Ejaculatory Ducts (Klinische Beobachtungen der Samenblase und Samenwege durch den Katheterismus der Duct ejaculatorii). *Ztschr. f. uro. Chir.* 1937 45 42.

The author considers catheterization of the ducts ejaculatorii as a valuable diagnostic and therapeutic

aid in diseases of the seminal vesicles and the seminal passages. He employs his own modification of von Lichtenberg's instrument. The indications for catheterization of the ejaculatory ducts are acute or chronic inflammations of the seminal vesicle, tumors of the seminal vesicle, chronic joint inflammations after the exclusion of other suspicious infective foci, inherited or acquired inflammatory strictures of the ejaculatory apparatus, bloody or painful ejaculations, chronic or recurrent paratesticular inflammations, sexual neuroses, and sterility. Catheterization is done for exploration, as well as for irrigation, for the introduction of medicaments, and for diagnostic and therapeutic purposes. Contraindications for catheterization are the acute inflammations of the urinary passages and of the glans penis. Stricture of the urethra calls for liberal dilatation. Patients, without exception, may be treated as ambulatory cases.

The author has collected the reports of over 100 cases. First of all, he describes the technique of catheterization with special consideration of the anatomical connections surrounding the verumontanum. For a roentgenological presentation of the seminal vesicle, an average of 2.5 ccm. of a contrast medium, preferably thorotrast, are introduced. After removal of the catheter and emptying of the bladder, the roentgen plates are taken in the usual

dorsal position. The contrast medium frequently remains in the seminal vesicle fifteen days or longer. The vas deferens often could be recognized ninety-six hours after the roentgenological procedure. The seminal vesicle gave no evidence of peristalsis. The author next describes the position and the anatomical construction of the seminal vesicle. Anomalies of this organ are seldom found. The study of its internal relief is accomplished by roentgen transillumination according to the Forssell technique as utilized in the studies of the mucous-membrane formation in the alimentary tract. The transillumination is valuable in estimating the structure of, and the changes in, the mucous membrane of the seminal vesicle, also, for examining the pressure pains, the mobility, and the adhesions of the seminal vesicle. Based upon the roentgen plates and the clinical histories, the author describes the alterations of the seminal vesicle in acute and chronic inflammation. In the treatment of inflammations of the seminal vesicle the author prefers the irrigation method. He uses a 2 per cent mercurochrome solution. The irrigations are done twice each month until the infection and the inflammation subside. If after three months the inflammatory changes remain unaltered despite the irrigations, operative removal of the seminal vesicle is undertaken.

(VON SCANZONI) MATHIAS J. SEIFERT, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Lombard P and Tillier H Spontaneous Fissures of the Skeleton (*La fissuration spontanée du squelette*) *Mém Acad de chir* Par 1938 64 336

This paper is a comprehensive case report of a patient with multiple fissures in the skeleton without history of trauma

The patient was first seen in 1912 when he was fifteen and a half years old. His limbs were short in proportion to the trunk the thighs were slightly flexed and outwardly rotated, and the knees in valgus deformity. Both femurs were curved antero-laterally. The spine showed lordosis and the feet were flat. The gait was awkward the knees crossing each other. The roentgen rays showed that the inferior epiphyseal lines of the femurs had disappeared.

The boy's mother had a similar deformity of the femurs and tibia but his brothers and sisters were normal. The patient was a full term breast fed baby but did not walk until he was twenty six months old. Deformity of the legs was noticeable at that time. Cenu varum was present at first but when he was seven years old the deformity had changed to genu valgum.

In 1912 osteotomy and correction was done on both femurs. In 1929 he reappeared as a dwarf his deformities having recurred and increased. His hands were of the achondroplastic type. Both femurs were sharply curved outward and forward.

The roentgenogram of the right femur showed a transverse fissure extending a little more than half way through the bone from the lateral cortex inward at the apex of the curve. The edges of this fissure were clear cut resembling a pseudarthrosis. The right tibia also showed a fissure on the concave side at about the middle of the shaft and this was less

pronounced than that located in the femur. A third fissure was found on the inferior cortex of the left femoral neck.

The fissure in the right femur seemed so serious that steps were taken to fill it in. Osteoposteal grafts were taken from the same femur above the lesion and layed across the defect. Vitamin D calcium salts and ultra violet ray treatment were also given. Pain in the bone disappeared and the patient got back to his work. Seven years later this fissure was much diminished and the one in the right tibia was completely closed. Fissures were still present however in the left ulna left tibia and fibula and neck of the left femur. The vertebrae were biconcave of fish type. The pelvis resembled the bones of osteomalacia. There was no abnormality in the blood count but the phosphorus content of the blood was moderately reduced.

Nine other cases are cited from the literature. Some of the patients had painful bones. All of them were more or less benefited by anti rachitic treatment. In 1 patient there were 43 lesions of the fissure type described some of them causing fractures. The blood phosphorus was reduced to 2 mgm. The autopsy findings in this case were parenchymatous degeneration in the liver congestion in the spleen hemorrhagic focus in the thalamic region of the brain diffuse nephritis congestion in the ovaries and adrenals myocarditis and normal parathyroid glands. WILLIAM ARTHUR CLARK M.D.



Fig 1 Fissure of the right femur

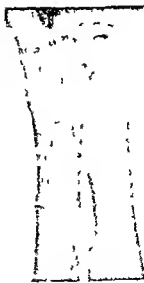


Fig 2 Cubitus gauche



Fig 1



Fig 2

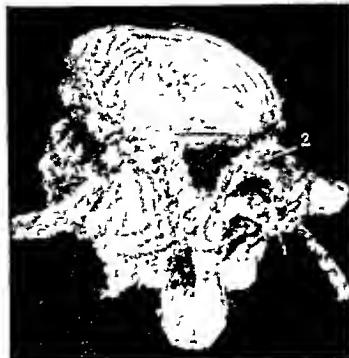


Fig 3

Fig 1 Inferior articular process of second lumbar vertebra Early arthritic changes The cartilaginous lining is thin in the peripheral portions Margins of the articular facet (a) are irregular At the cephalic pole may be seen hypertrophic synovial villus with fringed edges (b)

Fig 2 Left articular surface presents a convex, quadrangular outline and is larger than that of the opposite side The cartilaginous lining is brownish-red and is undergoing active degenerative changes (deforming phase) Granular masses of various sizes and forms are present

They are composed of chondroid substance and they produce a loose cohesion between the articulating surfaces The capsule is markedly thickened above and externally (1) (5 mm in thickness), whereas medially it is flaccid, paper-like and easily lacerated (2)

Fig 3 Male, fifty-six years old Fourth lumbar vertebra Superior articular process Right Superior articular surface presents a concave quadrangular outline The articular cartilage (1) is swollen and in some points appears to be semiliquefied

Putti, V., and Logroscino, D: *The Anatomy of Arthritis of the Vertebral Articular Processes* (Anatomia dell'artrite vertebrale apofisaria) *Chir d organi di movimento*, 1938, 23 317.

The authors studied the pathological changes which arthritis produces in the intervertebral articulations, being especially interested in the organic manifestations of the primordial phases of the disease They state that in many cases of so-called "lumbago" the clinician is often confused with reference to its cause, especially in the presence of negative roentgenograms On careful examination the condition is not infrequently found to be due to inflammatory processes involving the intervertebral articulations

After having discussed in detail the normal anatomy of the vertebral articulations and spinal column, Putti and Logroscino describe the commonly encountered gross pathological changes This study includes the careful examination of 75 spinal columns derived mainly from persons belonging to the working classes

They found that arthritis of the vertebral articular processes is encountered relatively very commonly In general, the articular surfaces are found to be grossly unaltered up to the age of thirty As the age advances, the lesions are found to be more progressive

In 25 preparations the lesions were present bilaterally, in 20 cases they were more advanced on the right side, whereas in 18 cases they were found to involve the left side The authors believe that this preponderance of lesions on the right side is probably to be attributed in right-handed persons to

a greater functional activity of that side, whereas in left-handed persons the lesions are more apt to develop on the opposite side

Putti and Logroscino also found that the lesions became increasingly more severe and more advanced toward the lower segments of the spinal column The severest lesions were usually found in the articulations between the third and fourth, and the fourth and fifth lumbar vertebrae Contrary to expectation, the articular surfaces between the fifth lumbar and first sacral vertebrae were often found to be normal, or to present only early arthritic lesions The results of statistical studies made by other investigators conform rather closely with the authors' findings In general it may be stated that arthritis of the vertebral articulations is characterized by an absolute inconstancy of localization and evolution of the lesions

The authors also stress the etiological importance of the axial deviation of one or more vertebrae as well as deviations of the lumbosacral angle In these conditions the vertebral processes are exposed to an increased strain and to unfavorable mechanical conditions It was found, in fact, that arthritic processes most commonly involve originally malformed articular facets

Of considerable importance are also the osteochondral changes, which usually involve only the margins of the articular facets In an early stage, the articular cartilage loses its smoothness, and becomes thinner and darker in color It finally becomes disrupted and leaves a markedly ragged margin (Fig 1). Often the degenerative processes progress concentrically and focus toward the center

The synovial fluid becomes more viscous and in some cases is found to contain a granular material derived from the breakdown of the articular cartilage. Figures 2 and 3 show cases of a cartilaginous ankylosis which represents the end stage of the arthritic process.

Putti and Logròscino also found marked alterations of the articular capsule in 57 of their cases. They believe that these changes appear only in the arthritic process and much before other lesions make their appearance. The capsule becomes markedly thickened and in 17 of the authors' cases this capsule and the ligamentum flavum combined measured 7 mm. Calcification may occur on the external or internal surface of the capsule (extramural and endomural calcification). In some cases the authors found a solid adhesion between the capsule and the spinal nerve at the point where the latter emerges from the intervertebral foramen.

Pathological changes of the synovial villi were also encountered. They consisted of an infiltration of connective tissue containing inclusions of chondroid and osteoid tissue. In some other cases degenerative and inflammatory processes predominated and the capsule appeared flaccid and thin and was easily lacerated. The villi became friable and presented a leaf like appearance.

Concerning the roentgen visualization of these arthritic lesions the authors found that this method is highly unsatisfactory as a means of diagnosing arthritis of the vertebral column.

RICHARD E. SOMMA, M.D.

Finder, J. G. Iliopectineal Bursitis. *Arch Surg* 1918 35 319.

The iliopectineal bursa is a constant anatomical structure which lies beneath the iliopsoas muscle just lateral to the femoral vessels and inferior to Poupert's ligament. It communicates directly with the hip joint in about 15 per cent of the cases. When the bursa becomes inflamed acutely it may give rise to a clinical picture of severe pain in the groin which is aggravated by movements of the hip particularly extension which is relieved by rest with the hip flexed. The involved area may show a fullness warm to touch and tender to pressure. A limp hampers the gait. In more chronic cases symptoms develop insidiously. At first pain may become apparent only after the fatigue of a day's work. Pain may be referred to the knee along the irritated femoral nerve. Limp, dragging of the extremity, stumbling and psoas weakness complete the picture. Tenderness is elicited at a point just below the inguinal ligament half way between the symphysis pubis and the anterior superior iliac spine. The patient assumes flexion, external rotation and abduction of the hip for relief.

The most frequent cause is trauma. The condition occurs as the result of multiple minute occupational injuries or violent muscular activity when a sudden forceful hyperextension is accompanied by a backward thrust of the body weight. The differen-

tial diagnosis should include hernia, psoas abscess, malignancy, femoral aneurysm and osteo-arthritis.

Treatment consists of rest and traction. Definite cystic enlargement should be treated surgically by obliteration of the sac. The communication between the hip joint and bursa must be eradicated at the same time.

A report of a case and a review of the literature are presented.

Novotny, O. The Arteries of the Mid Foot and Their Significance in Koehler's Disease II (*Die Arterien der Mittelfussknochen und ihre Beziehungen zur II. Koehlerschen Krankheit*). *Arch f. klin. Chir.* 1937 190 604.

The author's investigations concerning the blood supply of the metatarsal bones showed that the so-called Koehler's disease II (aseptic necrosis of the head of the second metatarsal and less often of the third, fourth and fifth) had a definite anatomical basis and that a disturbance of circulation, an ischemia, produced the lesion. A number of feet were injected with Teichmann's material and prepared according to Spalteholz' method in order to study the course and distribution of the arteries of the metatarsus. The method which requires a preparation over an average of six weeks brings out the principal differences between the blood supply of the first and that of the other four metatarsals. The nutrient artery of the first metatarsal diaphysis courses distally from the proximal end; the nutrition of the head is supplied by a greater number of arteries which enter the head from all four sides and develop a good anastomosis between the epiphyseal network and the respective metaphyseal and diaphyseal networks. The blood supply of the four other metatarsals is quite different; the nutrient arteries arise distally and run proximally along the shafts. The heads of the latter metatarsals are so supplied that the arteries as well as the collaterals enter the epiphysis only from the medial and lateral approaches. The dorsal and plantar sides are devoid of vessels. Anastomoses between the epiphyseal diaphyseal network were only slightly if at all demonstrable by injection. Mechanicostatic conditions lead to a circulatory disturbance so that abnormal weight bearing or trauma injures the collaterals of the 4 metatarsal heads and their blood supply is embarrassed or completely obliterated.

Axhausen, Konjetzny, Payr, Aschoff and others observed earlier that an interruption of the circulation produced a typical clinical picture. The author's work confirmed their findings objectively since the first metatarsal head receives blood from a greater number of vessels while the four other metatarsal heads receive their nutrition only through the two collateral sets of arteries. Contusions, strains and narrow footwear lead to a compression of the collaterals and to circulatory damage; if these conditions are protracted ischemia and then necrosis of the head follow. The author believes that the second metatarsal is most frequently the site of

Koehler's disease since the second ray, having the longest span, is most frequently subjected to weight-bearing tension stresses

(RIESS) JEROME G FINDER, M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Risolia, A. A : Arthrodesis of the Hip Joint in Tuberculous Arthritis (Arthrodesis de la cadera en la osteoartritis tuberculosa) *Bol inst de clin-quir*, Univ de Buenos Aires, 1937, 13 717

The author studied the invalided population of a French sea-coast community Under the guidance of Sorrel and Richard he worked in the Maritime Hospital at Berck Plage Here tuberculosis of the hip is evidently rampant, and constitutes one of the major surgical problems With such a mass of material available, he resolved to prepare a scientific exposition of this theme in the hope that practical and helpful conclusions might be drawn from it.

In the first part the author discusses the question, exposing the distinct surgical criteria, the chronological genesis, the principal techniques, the opportuneness and convenience Operative indication is given special attention, and in conveniently distributed chapters the author has recorded every element which he believes useful when confronted with the result of arthrodesis of any sort whatever He includes also a limited number of cases which he personally attended for a year, many of them with original and unpublished roentgenographs

Keeping in mind the data of the first part, in which he attempted to sum up the present state of knowledge, he undertakes in the second a rational study of the question on the basis of principles which to his understanding have been little exploited, and which undoubtedly, in his opinion, are of great practical value In this manner he has developed his point of view, which became concrete in a personal technique with which he experimented on cadavers

The task was not an easy one, the problem showed itself intricate and complex Often the arthrodesis of the hip joint showed results which were highly pleasing, at other times only moderately acceptable There was superimposed on this contradictory result the advance of the tuberculous process, which was very different in children and adults, and there were also differences according to the anatomical clinical type He does not deny, of course, the biological conclusions deduced from some studies which, like those of Lenche and Albee, treat of the intrinsic value of the bone graft However, the author believes that the rôle which they accord to it as a prosthetic element of specific disposition is excessively restricted Faced with the certain facts of progressive adduction, the antalgic attitude, the spontaneous or provoked pain, he finds the clear explanation of these phenomena in thinking of the physiomechanical behavior of the joint

Believing that certain anatomical, histological, and embryological ideas should be kept in mind for

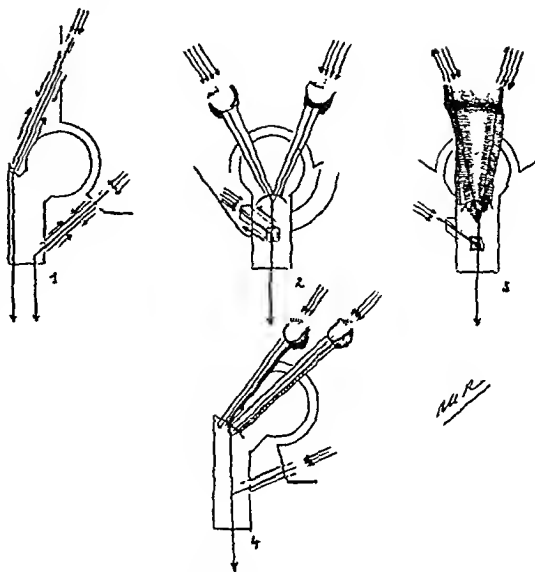


Fig 1 Illustrating the lines of force as they act on the insertions of the grafts in the author's triple arthrodesis

a good practical result in arthrodesis of the hip, the author devotes considerable space to these subjects The description of the vascularization of all the structures about the hip joint is particularly good



Fig 2 Drawing of the completed para-articular triple arthrodesis

and important in this discussion of the treatment of a blood borne infection

All operations for arthrodesis of the hip which have been or are popular have been classified by the author in the following manner

- 1 Intra articular arthrodesis
 - (a) Partial resection Technique of Albee (1908), and of Delaunay (1910)
 - (b) Impaction Technique of Nové Jozerand and Tavernier (1922-1923) and of Sorrel
- 2 Extra articular arthrodesis
 - (a) Juxta articular Technique of Haas (1923) of Hibbs (1926) of Massart and Ducroquet (1926) of Mathieu Wilmoth type II (1926) and of Putti (1926) also similar techniques of Albee Wilson and Richard
 - (b) Para articular Procedure of Maragliano type I and type II technique of the double insert of Albee (1913) of Sorrel and Richard of Rodriguez Egana (1933) of Delahaye (1932), and of Sacco (1932) trans trochanteran route of Calvé (1928) anterior route of Richard transfemoral route of Calvé (1929) and ischiofemoral technique of Trumble
 - (c) Combined Technique of Baron (1921) and of Mathieu type I
- 3 Mixed arthrodesis
Technique of Sorrel and Delahaye and of Lerche
- 4 Arthrodesis by simple rabbeting
Technique of Delahaye

All of the incisions commonly and exceptionally used in the approach to the hip joint are exhaustively described

In approaching the problem the author believes that the fundamental concept should be that the hip-joint articulation is a physical apparatus for movement and stability. An articular gearing should not be modified at caprice and any fixation must imply permanency. He holds that much care should be taken to see that the functional substitution with regard to the proximal articulations and the position chosen as most satisfactory remove the difficulties derived from the absence of dynamics in the ankylosed area. He cites the well known fact that children as a rule benefited more rapidly and permanently and adults on the contrary showed a greater number of less fortunate results. The problem was made even more perplexing by the fact that antalgic attitudes obstinate pain and dislocations were observed in patients who were treated irreproachably.

The major portion of his treatise is then taken up by a thorough illustrated study of the arthrodynamic of the hip joint. The mechanical behavior of the pelvifemoral muscular system during standing and walking is discussed and illustrated. The transmission of forces at the level of the articulation is illustrated and set forth in algebraic equations while other studies are made considering the thighs fixed and the pelvis movable and the pelvis fixed and the thighs movable. Using the above conclusions which

were worked out on a normal subject he then studied the conduct of the entire static dynamic system when associated with the development of coxalgia. Also, he discusses the activities of the static dynamic system described when there is present fibrous ankylosis (antalgia), osseous ankylosis and the state which is brought about by all of the fusion operations listed previously.

He concludes that for very good physiological and geometrical reasons none of the operations in present use is entirely satisfactory and he suggests one which he thinks would be an ideal solution. He believes that whatever the type of operation employed at the present there will always be a point of articular contact in which there is no absolute repose and pain will be or may be referred to that site in time. He reasons that from the mechanical point of view a hollow hemisphere (the acetabulum) with a slightly smaller hemispherical filling within it (the head of the femur) under conditions in which there is no direct contact between their surfaces is the ideal solution if it could be effected with a minimum of artifice and a solidity indifferent to the pressures exercised on the section of the solid hemisphere. This mechanical recourse would be to interpose three small points of support in such a way that they would crown the vertices of a triangle which unites them. Every displacement or contact of the surfaces would then be impossible. In other words he would apply the principle of the tripod to the arthrodesis of the hip joint and justifies his choice of procedure by comparing the results of mechanical studies on this with that of the others in common use. The operation is then described in detail and illustrated.

The author draws in part the following conclusions:

- 1 In spite of the most scrupulous execution there are observed particularly in adults frequent unfortunate and mediocre results such as pain and defective position.
- 2 The physiomechanical conduct of the pelvis and its proper and related articulations offer sufficient analytical material for interpretation of the bad results.
- 3 The development of a coxalgia alters the harmony of the whole pre-existing system and creates a new one.
- 4 Extra articular arthrodesis results repeatedly in an insufficient prosthetic value.
- 5 This insufficiency is due to the small capacity of the graft which suffers (a) an action of flexion in the transverse sense (b) an action of lengthening in the longitudinal sense and (c) an action of torsion over the same. Its incapacity to oppose the adductors results from the magnitude of the section and the caloric value of its components the greater or lesser rigidity. Its flexibility reaches defective positions principally adduction, slowly but progressively. These defective positions although slight produce constant and anti-natural pressures at the level of the articulation which induce an exacerbation of pain or the possibility that it will appear.

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7 The principle of the tripod may be incorporated in practice

8 The author offers a reasonable proposal for technical execution

For those interested in the study of tuberculosis of the hip, this article is recommended as a thorough review of the subject to date, and it presents a plausible, if at this time theoretical solution

JAMES K. STACK, M.D.

Couvelaire, R., Baumann, J., and Delinotte, P. **Technique and Indications for Complete Tibiotarsal Resection in the Treatment of Traumatic Lesions of the Ankle in the Adult** (Technique et indications de la résection tibio-tarsienne totale dans le traitement des lésions traumatiques du cou-de-pied, chez l'adulte) *J de chir*, 1938, 51: 354

As defined by Ollier, tibiotarsal resection means removal of the distal ends of the tibia and fibula and also the astragalus. Four cases are reported.

Case 1. Following a compound dislocation of the subastragal joint with fracture of the astragalus and a compound dislocation at the midtarsal region, the following procedures were done: débridement, astragalectomy, removal of the fragments of the external malleolus, reduction of the midtarsal dislocation, drainage, and partial suture. Six months later, because of pain and disability, all the joint surfaces of the lower end of the tibia, upper surface of the os calcis, and posterior surface of the scaphoid

were resected. Nine weeks later the patient could walk without pain, and when last seen, eight years later, function was good.

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Case 4. A woman aged twenty-four years had a high Dupuytren (Pott's) fracture with wide separation of the malleoli. Although the reduction seemed satisfactory, she had a poor functional result with extreme pain in walking. Blocking of the ankle joint and complete tibiotarsal resection were done.

In these 4 cases the operation was done, after a failure of astragalectomy in 1 case, for poor functional result due to deformity and bad callus around the ankle in 2 cases, and to avoid amputation in another case.

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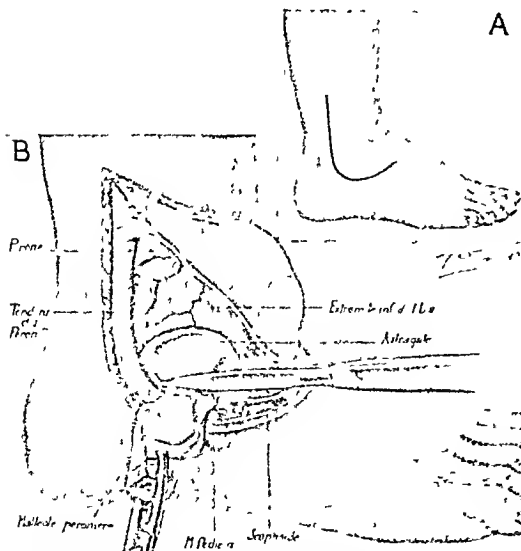


Fig 1. External approach. A The line of incision. B Primary ablation of the peroneal malleolus.

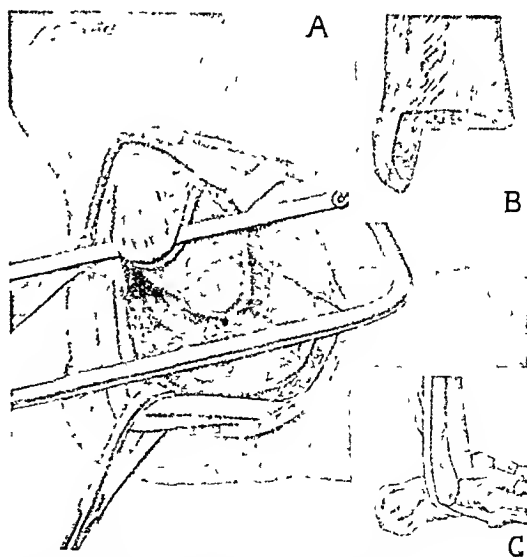


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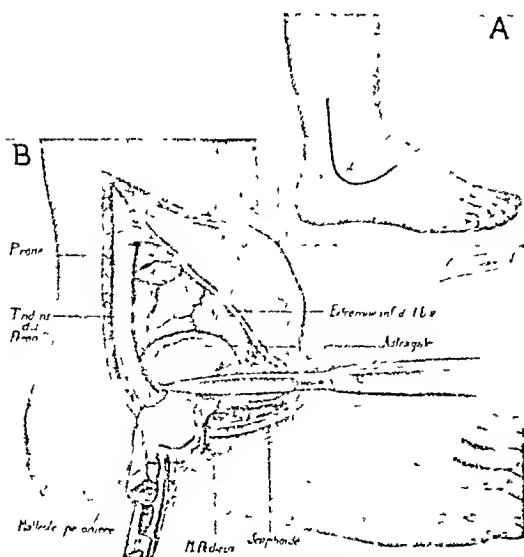


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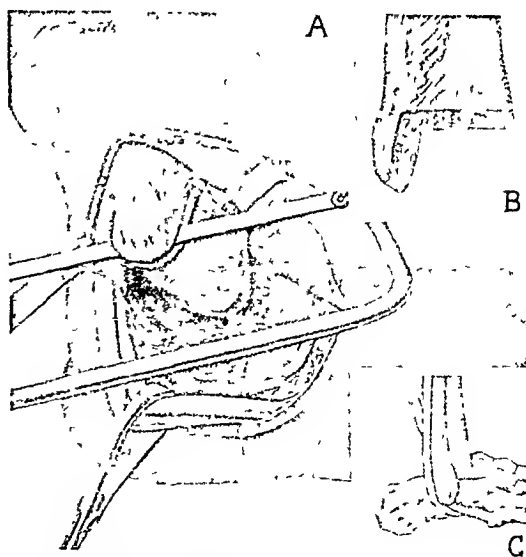


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at which time astragalectomy was preferred. The necessity of preserving the intermalleolar mortise in astragalectomy precludes the more accurate fitting of the bones that is obtained in tibiotarsal resection in which the malleoli are sacrificed.

There are three methods of approach: (1) external incision with removal of the external malleolus; (2) external incision with conservation of the malleolus; and (3) internal incision with removal of the mesal malleolus.

The incision for the external approach goes down the posterior border of the fibula, then curves forward under the malleolus. The fibula is sawed through about 4 cm. above the tip to give free access to the astragalus which is then removed. The articular surface of the tibia including its malleolus is cut off with a saw the plane being slightly oblique from behind downward. The top of the os calcis is then smoothed off level. The distal end of the fibula is discarded and this bone is left a little shorter than the tibia. The obliquity of the tibia section gives the foot a slight equinus which is desirable. The final position of the foot is then slightly posterior with the scaphoid resting against the tibia.

The external malleolus may be conserved by sawing off its mesal surface in a sagittal plane. This fresh bone surface is then fitted against the external aspect of the os calcis after the osteotomies described have been done on the tibia and the os calcis.

The internal approach is made through an incision which follows the posterior border of the tibia, cuts across the malleolus at the site of fracture, then goes downward and forward as far as the scaphoid. The flexor tendons are carefully protected while the fractured malleolus is excised. The foot is then dislocated externally, the astragalus is removed, the resections of tibia and os calcis done, and the foot put back as described above.

The indications for this procedure are: (1) certain fractures in which the bones and joint are exposed; (2) certain cases of vicious callus around the ankle; and (3) certain cases in which astragalectomy has failed. It is to be noted that indications are rare but precise.

In severe trauma in which amputation may be considered the total tibiotarsal resection may be done as a primary and prophylactic treatment with good result. Many surgeons have reported cases in which this has been done successfully. In late cases with infection, drainage has been facilitated and recovery hastened by removal of the cartilage surfaces by resection of the ends of the bones and removal of the astragalus.

The external approach is the method of choice. The internal approach is used when there is a large wound over the internal malleolus.

When the wounds are healed and the patient begins to walk the foot has a fairly good form. Viewed from the front it is a little thickened and from the side it shows a little shortening from 3 to 4

cm. by measurement. Although there is no ankle joint, all the other joints in the foot have sufficient mobility so that the patient walks well. Flexion and extension in the midtarsal joints amount to 7 or 8 degrees. Abduction and adduction are extremely limited. The foot print is almost normal save for the shortening. The limp is minimized by taking short steps.

WILLIAM ARTHUR CLARK, M.D.

FRACTURES AND DISLOCATIONS

King, T. Matti's Spongiosa Bone Transplant for Ununited Fractures. *Med J Australia* 1938 1: 526

Delayed union or non union are not uncommon occurrences in fractures of the long bones. In some cases union may be induced by the pressure stimulus resulting from weight bearing in a walking cast or caliper. If this fails, multiple subcutaneous bone drilling often succeeds. To safely carry out this procedure in the treatment of bones surrounded by important blood vessel and nerves requires an open operation. The opportunity afforded by the latter is used to better advantage by the employment of a freshening and grafting procedure. The author believes that in its main mass of bone cell an autoplasmic bone graft is alive and remains so. The graft brings to the ununited bone ends some ossifying power inherent in itself. Possibly the transplant carries with it hormones or enzymes (phosphatase). The most important part of a bony transplant is the spongiosa. The latter permits of an easy influx of blood which is rich in bone stimulating substances. The cortical bone acts mainly as a splint. Experimentally Matti has shown that new bone will form rapidly within a penosteal tube filled with cancellous bone and that active bone regeneration occurs in the endosteal cavity from which the spongiosa was removed.

These principles are used in the treatment of cases of delayed union or non union which do not respond to the more conservative measures. The author follows Matti's procedure. The incision is carried down to bone without individual dissection of tissue layers and the layers are retracted *en masse*. Bone exposure is minimal. In the case of the tibia longitudinal slices are cut from the bone ends with a large flat chisel which exposes the marrow cavities.



Fig. 1

Fig. 1. Bone chips obtained by cutting up the cortical bone removed from the fractured bones are packed loosely on top of the cancellous or spongiosa transplant.

in a troughlike manner. No tourniquet is used. The exposed medullary cavity is thoroughly curetted with a sharp spoon. The pseudarthrosis is excised except for a posterior bridge which is retained to act as a hinge. Through a lateral incision a trap door or plug of bone is cut from the lateral aspect of the great trochanter of the femur and a spongiosa transplant obtained for insertion in the trough ends of the pseudarthrosis. This procedure should precede the major one. The transplant is reinforced with chips cut from the cortical bone sliced from the fractured ends.

In some cases a tibial transplant is used. This is cut so that the spongiosa is abundant and is supplemented with cancellous bone curetted from the head of the tibia.

No attempt is made to realign the fragments, the trough being fashioned to bridge the fracture gap. A few sutures hold the surrounding muscles over the transplanted bone. The skin is loosely sutured to allow for drainage. A stab drain tube is considered essential to avoid a hematoma. Plaster casts are not applied for a period of a week or ten days to avoid pressure.

The advantages of the method are listed as follows:

1. There is minimal disturbance of the blood supply.
2. Should the operation fail the patient is no worse off, a fibrous hinge having been retained.
3. There is no shortening.
4. Scraping of the medullary cavity stimulates osteogenesis.
5. Spongiosa is easy to obtain.
6. The operation has been done in the presence of infection.
7. Union is quick.

A small group of cases is analyzed.

LOUIS SCHEMAN, M D

Boicey, B.: Habitual Dislocation of the Shoulder (Sulla lussazione abituale della spalla) *Chir d organi di movimento*, 1938, 23 354

Boicey states that there are about 20 different methods of treating habitual dislocation of the shoulder. Each investigator of the subject claims his own method to be superior to others, but in reality only a very few of the proposed methods are of definite value.

Habitual dislocation of the shoulder is said to occur in persons between twenty and thirty years of age. It occurs rarely in infancy and childhood and after the age of forty. The condition is encountered especially in the working classes of people and it occurs preponderantly in the male. The author studied 31 cases, of which 27 were men and 4 were women.

In 27 cases (87 per cent) the dislocation was anterior and in 4 it was posterior. Twenty dislocations occurred on the right side, 10 occurred at the left and 1 was bilateral.

Clinically, in 7 cases the condition was accompanied by a slight muscular atrophy around the involved joint. In 1 case this muscular atrophy was very extensive. In 9 patients, abduction of the arm could be performed only incompletely. One patient was able to produce a dislocation of the shoulder at will. Three persons complained of pain on pressure over the articulation especially near the coracoid process. In 10 cases the dislocation was reduced without the aid of anesthesia. In 1 patient there was found associated with the condition a slight paresthesia involving the fingers and the area supplied by the ulnar nerve.

Habitual dislocation of the shoulder is treated by performing a capsulorrhaphy according to Putti. This is based on the common observation that the pathological changes most often involve the joint capsule.

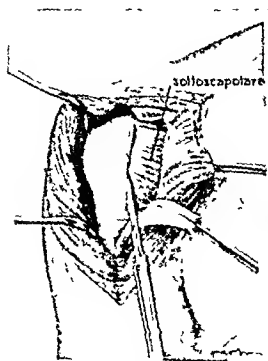


Fig 1

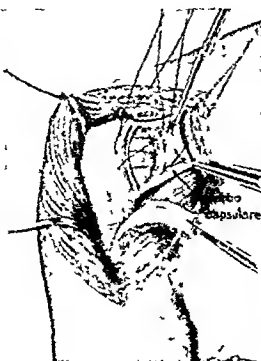


Fig 2

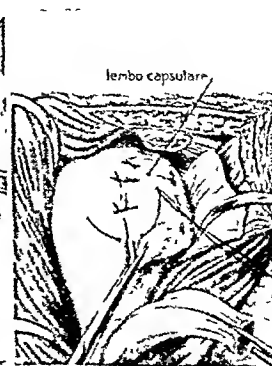


Fig 3

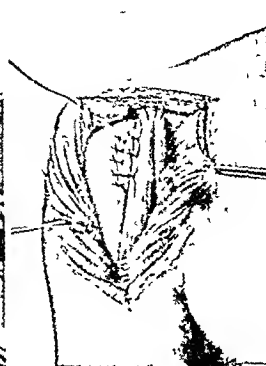


Fig 4

Fig 1 Disinsertion of tendon of infrascapular muscle. Fig 2 Showing closure of the capsular opening. The external margin of the capsular opening together with the insertion of the infrascapular muscle is sutured to

the border of the glenoid fossa. Fig 3 The residual capsular flap is used to reinforce the anterior wall of the capsule.

Fig 4 Re-insertion of the infrascapular muscle.

On opening the articular cavity, the latter should be inspected and any pathological alterations should be removed if possible. The purpose of the operation is to make the articular cavity narrower so as to prevent dislocation. If the dislocation recurs following the operation the technique employed by the surgeon has probably been inadequate.

Boicev operated upon 24 patients with habitual dislocation of the shoulder according to this technique. The results obtained were invariably excellent and the movements were performed by the patient with greater ease. External rotation, however, remained somewhat impaired. In 2 patients the dislocation recurred after two and four months, respectively.

The author summarizes the results obtained by stating that in 17 cases (65.3 per cent) a complete and permanent recovery was obtained. In 4 cases (15.3 per cent) there were limitations of movement. In 2 cases (7.6 per cent) the condition recurred and in 3 cases (11.5 per cent) no follow up history could be obtained. RICHARD E. SOMMA, M.D.

Felsenreich F. Fundamental Observations on the Symptomatology and Treatment of Unreduced Medial Fractures of the Femoral Neck Healed Respectively by Non Union or False Joint (Grundsätzliche Bemerkungen zur Anzeigstellung und zur Behandlung verschleppter bzw. pseudarthrotisch oder nearthrotisch geheilter medialer Schenkelhalsbrüche). *Zentralbl. f. Chir.* 1937 p. 2407.

Fractures of the femoral neck that are unreduced or have healed by fibrous union are seen more frequently now according to the author because of the wide spread knowledge of operative results the doctor's interest is aroused and the patients themselves consult the surgeon more often. In Austria nailing is carried out but cases of non reduction still occur which even today are treated inappropriately and since the surgeon believes that contra indications exist operation is not considered. In spite of accurate directing instruments nailing cannot always be accomplished. (The author uses the Valls instrument). Frequently the roentgen reduction is insufficient and sufficient experience may be lacking. According to the opinion of the author healing is produced in medial fractures in the rare cases by traction straps except in a young patient. In the application of plaster the outward rotation and adduction are frequently not sufficiently overcome. Therefore the patients are denied early appropriate treatment. The author then cites several of the so-called contra indications. In the treatment of ununited fractures different methods are employed. Smith Petersen, Johansson and Boehler recommend nailing. Pauwels prefers the subtrochanteric wedge osteotomy. Both methods have their advantages. Bony healing and weight bearing take place earlier with nailing. Moreover it can be undertaken at any time whereas Pauwels first recommend the osteotomy if the fractured sur-

faces have become polished which often takes a long time. Boehler's instructions are as follows.

Traction should be applied at the head of the tibia for correction of upward displacement of the trochanter. If this is obtained the question of an operation is first considered. According to Boehler's opinion displaced fractures of the femoral neck can still heal if after accurate reduction a well fitting plaster is put on for many months. The reduction succeeds, according to the opinion of the author only if enough of the head and neck of the femur still exist that both fragments can be tightly wedged into each other. The head is always clearly to be seen in the roentgenogram the neck is not. Boehler recommends three views but frequently these do not accurately show the relationships. Therefore the surgeon himself must occasionally be present at the taking of the films. The false joint can be either loose or tight at the raised trochanter. If the latter is the case, traction must precede reduction or operation. We have today the means at hand to be able to determine at the first examination which method is to be chosen. Above all the bone must be roentgen rayed in strong inward rotation. Tight pseudarthrosis with resorption of the head and neck are unfit for nailing but are suitable for wedge osteotomy. The reduction results from strong inward rotation the patella facing 20 degrees in ward there must be strong abduction and the neck must be thrust firmly into the head. In case the fractured surface of the neck is sealed the medullary cavity must be re opened by repeated borings from the subtrochanteric fossa. The nail is placed centrally. In front of the nail head a small pin is driven so that the bolt cannot slide out. Distraction must be used in allowing the bearing of weight in cases with marked osteoporosis. Early motion is allowed in bed. All cases are nailed in which enough head and neck exists and in which reduction is easily obtained. BARBARA B. STINSON, M.D.

Micca A. B. and Teramo M. A Clinico Roentgenological Study of Vertical Fractures of the Patella (Contributo clinico radiologico alle fratture verticali della rotula). *Polichin* Rome 1938 4, sez. chir. 54.

The authors give a thorough review of fracture of the patella from the roentgenological point of view and in addition present a series of their own.

They conclude that

1. The lesion occurs at either the medial or lateral third and almost never in the middle of the patella.

2. There are no pathognomonic symptoms of the lesions which makes it difficult to make a precise diagnosis.

3. A diagnosis can be made only after careful roentgenographic examination.

4. Plaster cast immobilization should be done.

5. A well prepared bibliography as well as a discussion of the etiology pathology diagnosis prognosis and treatment of the condition is given.

CARLO S. SCLERDI, M.D.

Linden, O. . A Comparative Study of the Treatment of Oblique Fractures of the Shaft of the Tibia by Osteosynthesis, Osteotraction, or Only Reduction and Plaster *Acta chirurg Scand*, 1938, 80 365

The author carried out a follow-up examination of oblique fractures of the shaft of the tibia and fibula in patients under treatment at the Maria Hospital in Stockholm, during the period from 1908 to 1932. The treatment adopted during this period was osteosynthesis with screw during the period from 1908 to 1929, skeletal traction from 1909 to 1932, and plaster alone during the whole period, with or without preliminary reduction. Rissler's method, the operative technique, with illustrations showing the instruments used, is fully described in this article. All cases subjected to osteosynthesis and extension and those treated with plaster only, from 1909 to 1932, were followed up and re-examined. The investigation was carried out with a view of finding out which therapeutic method gave the best results, either osteosynthesis with screw or skeletal traction. There has been no selection of cases in favor of one or the other method of treatment, one and the same method being chiefly employed during some definite period of time.

As the hospital was under the same supervision (Key 1911 to 1932) during nearly all this time, the author believes that this clinical material is adaptable to a comparative study. In the examination of these various groups, he tried, when possible, to come in contact with the patients personally, and himself examined all the patients that came for the follow-up examination. He was careful to observe their gait, as evidence of malposition and shortening become more evident. All cases were roentgenographed and, in addition, the nearest joint also was roentgenographed, or, if thought advisable, both joints and also the joints of the uninjured leg. In addition, in a large number of cases the non-injured leg was roentgenographed for comparison. Well kept hospitals and out-patient departments facili-

tated this study. Compound fractures were included in this study.

About 250 cases had follow-up examinations and studies, but for various reasons, 50 were left out of his report. Brief case reports of 47 simple fractures treated by immediate osteosynthesis, 20 simple fractures treated by simple osteosynthesis, 15 cases of compound fractures treated with osteosynthesis, 50 cases of simple fracture treated with skeletal traction, and 19 cases of compound fractures treated with skeletal traction are described in brief case reports, and the end-results are stated. Many angles of this study are discussed in detail, such as complications in connection with the later osteosynthesis, the time of the osteosynthesis, and the treatment of compound fractures with osteosynthesis.

As a result of this thorough and detailed study of the end-results in these cases, Linden concludes that treatment by extension has not yielded as favorable results as hoped for at the outset. Moreover, he believes, the treatment is difficult and demands careful supervision and repeated roentgenographic control. Moreover, shortening and malpositions occur. He also finds it difficult for many patients to put up with extension and believes it is common to underrate the discomforts accompanied by persistent extension. He agrees that fractures which can be easily reduced and retained in good position after reduction by means of a simple plaster support should not be operated upon, but he believes that it is different with oblique fractures of the shaft of the tibia as aggravation of this condition subsequently arises in the form of shortening or angulation. It is his opinion that such fractures should be subjected to osteosynthesis with screw without delay.

His investigation of these cases has shown that the method of osteosynthesis employed at Maria Hospital is very good with regard to the period of repair and end-result. However, it is essential that operation be carried out by an experienced surgeon with good assistance and under reliable aseptic conditions.

EMIL C. ROBITSHEK, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Suzman M M, Freed C C and Prag J J
Studies on Experimental Peripheral Vascular
Disease with Special Reference to Thrombo
Angiitis Obliterans *South African J M Sc*
1938 3 29

While the ultimate histopathological picture of thrombo angiitis obliterans is well known the cause of the disease remains unknown. Because of the fact that the histology of the earliest stages of the disease is not definitely known considerable diversity of opinion exists concerning the sequence of the pathological changes. Vasospasm seems to play a rather considerable part in the genesis of the disease. It has been demonstrated by means of skin temperature reactions that in the early stages of thrombo angiitis obliterans the arterial obstruction may be partially or entirely due to vasospasm. The maintenance of this spasm presumably leads eventually to damage of the vessel wall and subsequent thrombosis. Therefore the authors assume that inquiry into the cause of thrombo angiitis obliterans should be directed to an investigation of the factors which bring about continuous spasm rather than to a study of the ultimate clinical and pathological features.

Experimentally it has been demonstrated by such investigators as Rothlin, Kaunitz, Polak and MacGrath that the production of continuous arterial spasm following the administration of ergot or of certain of its preparations leads to a clinical condition and a pathological picture indistinguishable from the stages of the disease observed in thrombo angiitis obliterans, namely spasm, cyanosis, thrombosis and trophic lesions such as ulceration and gangrene. Also it has long been known that poisoning with ergot leads to intense vascular spasm followed by organic arterial obliteration with subsequent trophic changes. There are too numerous references in the literature to cases in which the administration of ergotamine tartrate for the relief of conditions such as pruritus, goiter and migraine resulted in vasomotor disturbances and gangrene of the extremities.

These considerations led the authors to believe that information on the pathogenesis of thrombo angiitis obliterans could be obtained by a study of the factors involved in the experimental production of gangrene by means of ergot. One factor which seemed particularly noteworthy at the outset of their study was that thrombo angiitis obliterans is almost completely restricted to males. A careful search of the entire literature on the subject disclosed only 23 cases of the disease in females, most of which were mild and some of which were quite doubtful as to diagnosis. The authors assumed that this difference in sex incidence of the disease could

reasonably be related to possible underlying hormonal influences. It is the investigation of this hypothesis which forms the subject matter of their paper.

In their experiments the authors used methods similar to those used by MacGrath who in 1933 demonstrated that female albino rats receiving sufficiently large doses of theelin ovarian follicular hormone are protected from the trophic disturbances which otherwise regularly follow intoxication with ergotamine tartrate while the male rats receiving theelin although not protected demonstrated significant delay in the onset of trophic disturbances as contrasted with the male rats not receiving ovarian follicular hormone. In addition the authors have observed the effects of castration and of the administration of ovarian follicular hormone to castrated male rats. The results of their experiments are set forth in their paper.

Male and female albino rats were used the ages varying from eighty to one hundred and twenty days. They were fed and housed according to the standards of the Wistar Institute. The weight of the animals varied from 90 to 250 gm. The preparation of ergot used to produce trophic changes was ergotamine tartrate. The drug was injected into the subcutaneous tissues of the back the dose varying according to the experiment from 25 to 50 mgm. per kgm. of body weight. The preparation of ovarian follicular hormone used in the course of the experiments was estroform containing 1000 international units per cubic centimeter. Observations of the trophic changes occurring in the tail were made daily until it was apparent that no further changes were taking place. The immediate consequence of the administration of ergotamine tartrate was a state of collapse lasting for from one to two hours. Within twenty four hours there was a variable degree of hyperemia of the distal portion of the tail. Cyanosis followed the hyperemia in from three to ten days. The involved portion then became gangrenous becoming black hard and dry and showing a line of demarcation. The distal gangrenous portion would often slough off completely. Occasionally ulcerative areas were noted on the affected portion of the tail.

The end results of the experiments are of considerable interest and establish the following facts:
1. Neither a single small (1000 I.U.) nor a single large (10000 I.U.) dose of ovarian follicular hormone afforded complete protection against the trophic changes produced by ergotamine tartrate in both male and female rats.

2. The administration of repeated small doses (500 I.U.) of ovarian follicular hormone completely protected female rats from the trophic changes produced by ergotamine tartrate whereas in the males only a very slight degree of protection was afforded.

3 Preliminary castration of male rats did not affect the extent of trophic changes produced by ergotamine tartrate

4 The administration of ovarian follicular hormone to castrated male rats afforded complete protection against the trophic changes produced by ergotamine tartrate

Clinically, the fact looms large that thrombo-angitis obliterans rarely occurs in females. In 1936, Friedlander, Silbert, and Laskey demonstrated that while a gangrenous process could be produced in male rats by daily intraperitoneal injections of denicotinized tobacco extracts, none of the female rats developed this lesion. The natural deduction from considerations such as these is that the reason the disease occurs almost exclusively in males is either because of the presence in them of some thrombogenic agent, possibly of a hormonal nature, or, on the other hand, because of the absence in males of a factor present in females, which tends to prevent the development of arterial thrombosis. Recent investigations have demonstrated a close relationship between the ovaries on the one hand, and the blood volume and the blood viscosity on the other. In Buerger's disease there is a significant lowering of the blood volume and an increase in the blood viscosity.

What biological difference protects women against this disease? Friedlander, Silbert, and Laskey in 1935, while investigating this subject thought it logical to assume that the ovaries might be responsible for this immunity. It is known that repeated attacks of phlebitis in the lower extremities occur during the years following bilateral oophorectomy and also that chemical changes occur in the blood. In the cases of 25 women who had undergone bilateral oophorectomy, these investigators found that the average blood volume showed a reduction of about 25 per cent from the normal, also, coincident with this there occurred an elevation of the cholesterol and fibrinogen of the plasma and an increase in the viscosity of the blood. The same results were obtained in experimental animals after bilateral oophorectomy. Later experiments by these same authors have shown that the administration of ovarian follicular hormone to castrated women, to men with thrombo-angitis obliterans, to castrated female cats, and to thyroidectomized male cats, in all of whom the initial blood volume was low, caused a consistent rise of blood volume to the normal level.

In attempting to explain in what way castration was responsible for the immunity to gangrene which was demonstrated by the male cats receiving ovarian follicular hormone, the authors give the following reason:

After castration there is hyperplasia of the basophil cells of the anterior lobe of pituitary gland which is accompanied by a great increase in the concentration of the gonadotropic hormone in the blood and urine. The great increase of this substance may have enhanced the protective action of the administered estrogenic substance in some unknown

manner. It is not certain whether castration or the administration of estrogenic substances produces changes in the blood volume or blood viscosity of male animals, which are similar to those found in female experimental animals.

MATHIAS J. SEIFERT, M.D.

Rosenak, S.: Congenital or Spontaneous Pathological Arteriovenous Communications and Their Surgical Importance (Ueber ange borene, bzw spontane krankhafte arterio-venose Verbindungen und ihre chirurgische Bedeutung) *W'ien klin W'chenschr*, 1937, 1 962

Abnormal arteriovenous communications are more frequent than is generally supposed. Recently various investigations have been made in this field, on precapillary short circuits. Histologically a normal arteriovenous anastomosis shows a distinctly arterial structure. It is of small caliber, from 0.1 to 0.3 mm, with noticeably strong musculature and with longitudinal folds of the intima. The pathological anastomosis, on the contrary, e.g., aneurysma arterio-racemosum, is surprisingly large and has thin walls. The normal is functionally capable of closing, the pathological is not. The latter, therefore, causes symptoms similar to those of traumatic arteriovenous aneurysm. How the pathological condition is produced is unknown. Repeated slight trauma and endocrine influences have been suggested.

The persistent incapability of closure of the pathological arteriovenous anastomoses causes disturbances of the peripheral and cardiac circulations. Peripherally, a dilatation of the affluent arterial trunks and their collaterals develops (Franz) which is actually produced reflexly from the periphery. The author attributes the hypertrophy, which is present usually in the growing period and always in the congenital cases, to the improved capillary circulation. However, the peripheral circulation deteriorates if the arteriovenous communications enlarge. Trophic disturbances, even necroses result, likewise cyanosis, cramps, and ischemic muscular paralyses, and varicosities of the veins. Cardiac disturbances, frequently observed in traumatic arteriovenous aneurysms, are unusual.

The diagnosis is not easy. Pathological elongation of the affected part, and occasionally perceptible bruit and elevation of the skin temperature are signs. The best method of diagnosis at present is arteriography.

In the further course of the malady venous enlargement is observed. The differentiation from congenital phlebarteriectasis may be very difficult. For differential diagnosis the Nicoladoni-Israel-Branham sign is valuable. Increase of the blood pressure with a falling pulse rate occurs on finger compression of the arterial trunk leading to the fistula. The diagnosis may be aided further by (1) noting the comparative differences in the heat production, from 1 to 20, (2) estimation of the contained oxygen, 5, 9, and (3) arteriography.

In the treatment the injection of thrombosing agents such as zinc chloride ferric chloride alcohol and urethan cauterization electrocoagulation or operative separation and removal of the arterio venous communications are to be considered

Spontaneous arteriovenous malformations are of frequent occurrence 400 cases have been noted They are found usually in the central nervous system, or in the carotid area One hundred and six cases affecting the extremities alone are described hand 21 fingers 18 forearm, 13 upper arm 5 arm 5 shoulder 4 foot 25 leg 2, hip 2, gluteal region 2 not stated 9

Elongation of the affected members was noted in 37 cases local trophic disturbances in 16 local excessive heat production in 30 arteriovenous in 18, cardiac hypertrophy in 11 local hum and bruit in 29 and the Branham Israel sign in 17 In 31 of these 106 non traumatic cases the condition was congenital in 27 it appeared at puberty

Rosenak presents two interesting case histories of his own

The first was that of a man forty one years old Ten years ago the tips of three fingers had been struck by a hammer The wounds healed slowly Gradually the third fourth and fifth fingers began to swell and the dorsal veins of the hand became tortuous Eight years ago a pulsating tumor appeared in the palm of the hand There were pains in the fingers Ligation of the ulnar artery was done which resulted in the absence of pain in the fingers for five years During the past year the pain recurred with ulceration of the third finger and amputation was recommended Upon examination marked dilatation of the veins of the lower third of the forearm and of the back of the hand was noted There was a bluish discoloration of the back of the hand and of the third fourth and fifth fingers with diffuse swelling These fingers were elongated by 35 cm Compression of the radial artery caused a decrease of the swelling and discoloration On the third fingertip was an ulcer of the size of a pfenning In the palm there was a pulsating swelling with a blowing murmur which disappeared on compression of the brachial artery Arteriography of the radial artery revealed dilatation of the main vessel at the superficial palmar arch and at the origin of the third to fifth common volar digital arteries At operation ligation of the superficial palmar arch radially to the origin of the common digital arteries was done Immediate cessation of the pulsation swelling and pain occurred The ulcer healed in four weeks The patient is now self supporting

The second case was that of a man aged thirty three years For the past twelve years there has been an enlargement of the left forearm with marked tortuosity of the veins of the upper arm There was heaviness and a lack of strength in the whole arm The blood pressure was 145/85 and 220 mm on compression of the left brachial artery measured on sound side This increase of pressure on compression of the artery was accompanied by reduction of

the pulse rate from 86 to 65 (Nicoladoni Israel Branham sign) The difference between the circumferences of the upper arms was 4 cm both of the forearms measured 25 1/2 cm

The affected forearm was 3 cm longer than the right The veins of the left arm up to the groove between the deltoid and pectoral muscles were greatly enlarged and pulsated A loud systolic hum was heard from the back of the hand to the heart On elevation of the arm and compression of the brachial artery the veins emptied themselves completely If an elastic tube was then applied to the elbow region and the arterial circulation was unobstructed the veins swelled only distally to the tube a sign that the abnormal arteriovenous communications were in the forearm or hand Arteriography of the brachial artery showed dilatation of the brachial, radial and interosseous arteries while the ulnar artery was of normal size

At operation double ligation of the radial artery was performed, in the upper and lower thirds Definite improvement followed and there was relief of the pain and weakness Arteriography one half year later showed enlargement of the interosseous artery with numerous varicose tributaries also varicose convoluted vessels in the thenar area which communicate chiefly with the superficial palmar arch but to some extent also with the deep arch Resection of the interosseous artery was followed by further improvement The resected portions of the artery showed histological degenerative changes Three illustrations are presented

(FRANCE) J M SALMON MD

BLOOD TRANSFUSION

Durán Jordá F. The Blood Transfusion Service in Barcelona Technique and Use (El servicio de transfusión de sangre de Barcelona Técnicas y utilidad) *Rev de sanidad de guerra* 1937 1 397

The emergencies of war have compelled the organization and creation of an efficient and simple blood transfusion service Based on the conservation of citrated blood the service uses voluntary donors in large centers of population and has at present 4,300 donors from various walks of life The distribution of donors by blood groups is as follows Group I-AB 136 (Group II-A 2,214 Group III-B 334 Group IV-O 1,716 The blood is tested for syphilis and malaria eliminated if possible by a careful history After customary antiseptic and aseptic precautions the donor is bled from a vein into a special flask with filter attached The blood is removed while the donor is fasting to avoid postprandial coagulability and excess of proteins fats and glucose which is found at the height of digestion The Russian school (Filatov Blina Doepf) has demonstrated that there are more reactions from donor's blood taken after meals About 400 ccm of blood are taken from each donor and mixed with a 4 per cent solution of sodium citrate (10 ccm per 100 ccm of blood) About 30 or 40 bleedings are

done at one sitting. Then the blood is tested for grouping and for bacterial contamination. Each container is labeled with the number of the donor, the blood group, and the serological reaction for syphilis. From each container a small amount of blood is taken with a capillary tube and used for a bacteriological test on agar and for blood-group determination.

After twenty-four hours, when the sterility test is read, the blood is filtered. It is insisted that the blood be filtered before each transfusion to avoid the injection of small coagula, and accumulations of fibrin, which may form small emboli.

Filtration of individual blood specimens is done with the same container in which the blood was taken from the donor. Atmospheric pressure filters the blood through a filter in the cap of the flask. Pooled blood is filtered aseptically through a special apparatus under negative pressure. The filtration occurs through a special layer of silk material. The transfusion is done by an original method, using a special two-compartment, Durán tube, under 2 atmospheres' pressure. The capacity of the tube is 400 c cm. The sterility of the blood is determined at a glance by the color. It must be ruby red. Bacterial contamination causes gas formation and a blue venous color. By means of ordinary hypodermic needles the transfusion is readily given into any vein without dissection. Thus, the author transfused a child of five years with 300 c cm. of blood without dissecting any veins. During the military offensive the author transfused 27 liters of blood by this means. The blood must be warmed on a water bath to 45 degrees C for twenty minutes. The only reaction observed has been chills. This may be avoided by injecting blood at a temperature of 42 degrees. Chills are treated by injecting minims of adrenalin, and giving calcium chloride intravenously.

JACOB E. KLEIN, M D

Durán Jordá, F.: The Transfusion of Citrated Conserved Blood. The Problem of Dose (*La transfusión de sangre citratada conservada. El problema de la dosis*). *Rev de san de guerra*, 1937, 1: 322

A difficult problem is to decide how much blood should be given in an individual case. The cases may be classed as acute hemorrhage, shock, chronic

anemia, and those in which it is desired to stimulate the defensive powers.

The acute hemorrhage combined with physical and psychic shock must be treated by transfusion before surgery may be attempted. This usually is a massive transfusion with large amounts of blood. For example, one wounded man was given 2,400 c cm. of blood in seven hours.

The author presents a series of brief clinical cases to emphasize some basic facts.

The first was that of a soldier with bullet wound in patella with exit in the middle third of the leg, comminuted fracture of the tibia, and marked destruction of the muscles. There was intense shock and severe acute anemia. The patient received 1,200 c cm. of blood at one time. The surgeon then amputated the leg. The general condition was much improved. The next day the patient received another transfusion of 300 c cm. and was evacuated.

In the second case there was a shrapnel wound of the tibia with intense hemorrhage and shock. The patient was given 900 c cm. of blood which restored him so that his leg could be amputated. During the operation 600 c cm. were given and later 300 c cm. The patient was returned to bed with a pulse of 120. He died two days later in a toxic condition not related to the transfusion.

In the third case there was a bullet wound with entrance in the abdomen 3 cm. above the left iliac crest and point of exit in the right para-umbilical region. After laparotomy a severe abdominal hemorrhage occurred. Immediate transfusion of 1,200 c cm. of blood brought about a veritable resurrection. At the end of the laparotomy 600 c cm. of blood were transfused, and seven hours later 600 c cm. more. The patient died forty-eight hours later of peritonitis.

A number of other similar case records are presented which show that the transfusion is a very important weapon in treating shock.

The author has also given small transfusions, from 250 to 300 c cm., as a biological immune stimulant when it was necessary to raise immunity to infections. Thus, he treated a ten-year-old girl for streptococcus-*viridans* septicemia with transfusions of 300 c cm. daily. This improved the hemogram and prolonged the child's life. JACOB E. KLEIN, M D

SURGICAL TECHNIQUE

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Bookless A S. Uremia After Hemorrhage. *Guy's Hosp Rep* Lond 1938 83 22

Gastric uremia following gastric hemorrhage is said to be fairly common. In the cases of 13 patients there was a marked increase in the blood urea, and in 5 it proved to be fatal. In these the urea continued high. In the cases of patients showing recovery the urea was high at first, but a decrease was noted with clinical improvement in the patient. Though the blood urea begins to rise shortly after the occurrence of gastric hemorrhage the clinical symptoms do not appear for a day or so or until the period of secondary hemorrhagic shock. This is due to fluid starvation or recurrent bleeding or both and the patient's condition becomes worse rapidly the pulse tension and the output of urine are diminished. The lowest blood urea coincident with toxic symptoms was 190 mgm per 100 c cm.

The author believes that uremia following gastric hemorrhage is due mainly to increased breakdown of the tissue protein. This process is rapidly increased by sudden loss of blood and is maintained or accelerated by dehydration. Sometimes absorption from the bowel oliguria or renal depression may augment the uremia.

The objects of treatment are to stop hemorrhage and to combat secondary collapse as indicated by a raised blood urea. All of the patients were starved by mouth for twenty four hours although 10-ounce saline infusions were given by rectum at intervals of four hours. Graduated milk and water feedings were given during the next four days and on the sixth day the first stage of a standard ulcer diet was begun. Transfusion was needed only for severe anemia, severe dehydration and before operation.

JOHN WILKIE EYTON, M.D.

Hageman P O and Blake F G. Clinical Experience with Sulfanilamide in the Treatment of Beta Hemolytic Streptococcal Infections. *Am J Hyg* Sc 1938 19, 163

The authors report a series of 114 consecutive cases of beta hemolytic streptococcal infection in patients who were treated with sulfanilamide. The oral administration of sulfanilamide seems to be the best method and the authors feel that parenteral administration is indicated only when oral medication is impracticable. In the cases reported the dose by mouth was 1 gm per day for each 20 lb of body weight up to 100 lb divided into 4 doses which were given at six hour intervals but not more than a total of 5 or 6 gm per day for persons weighing more than 100 lb. It is believed that 5 gm per day represent the maximum therapeutic dose of sulfanilamide to be given orally per day.

Twenty seven cases of erysipelas treated by other methods in the New Haven Hospital, New Haven, Connecticut between January 1 1936 and January 1 1937 were reviewed and the results were compared with those obtained in the cases treated with sulfanilamide. The duration of the disease was thirteen and nine tenths days in the control group as compared with five and three tenths days in the group treated with sulfanilamide. Spread of the disease was noted in 66 per cent of the control series while only 11 per cent of the treated series showed more than slight marginal spread.

In a group of 7 cases of pneumonia 3 of the patients had had purulent complications at the time treatment was begun. In these cases the course was noticeably more protracted with one exception. In 2 of the patients the condition subsided without surgery while in 1 a thoracotomy was necessary even though the pleural exudate had become sterile. In this case and that of 2 other treated subsequently the course of streptococcal empyema seemed to have been transformed into a subacute inflammation in which considerable organization thickening of pleura and contraction of the chest treated therapeutic problems of considerable significance. The remaining cases had no purulent complications at the onset and developed none after treatment with sulfanilamide was started. Recovery in these cases was more prompt and all of the patients recovered.

Among 5 cases of meningitis there were 2 recoveries these represent the only patients who have survived a beta hemolytic streptococcal meningitis in this hospital in the past ten years.

In a group of 15 cases of mastoiditis only 2 patients required mastoidectomy after treatment with sulfanilamide was started all of the patients recovered.

Eleven cases of otitis media subsided without developing a discharge. In the case of one patient relapse occurred but the discharge promptly subsided when sulfanilamide was given. Mastoiditis or other infectious complications did not develop in any instance after treatment was started. All of the patients recovered.

Seven patients with scarlet fever were treated with sulfanilamide 4 of them received no serum. The toxic phase of the disease seemed unaffected by the sulfanilamide. There were however no septic complications in this group.

Of 11 patients who were treated for lymphadenitis only 2 required surgical therapy after treatment was started and one of these had a mixed infection. Adenitis recurred in 2 cases but both patients responded satisfactorily to sulfanilamide.

Sixteen patients with pharyngitis and toxic adenitis responded fairly promptly to treatment with sulfanilamide and none of them developed infectious complications.

Cyanosis was by far the most frequent complication of the administration of sulfanilamide. The authors question whether it is really a complication or a natural concomitant of the administration of this drug. Spectroscopic studies of the venous blood of 5 patients revealed evidence of methemoglobinemia, estimated to represent from 5 to 15 per cent of the total hemoglobin. In 14.96 per cent of the cases a febrile reaction occurred, with or without a rash, and coming on usually between the seventh and tenth days of the drug therapy, the term "drug fever" is suggested by the authors for this complication. Nitrogen retention developed during therapy in 3 instances, it subsided promptly in 2 of these when the drug was discontinued. In 1 instance, toxic hepatitis was noted in a patient with probable chronic cholecystitis. One patient who had been taking sulfanilamide at home was admitted to the hospital with thrombocytopenic purpura. No cases of neutropenia were noted in the present series.

The authors conclude that sulfanilamide, which is far from being non-toxic, favorably modifies the course of beta-hemolytic streptococcal infections in most instances.

HAROLD C. OCHSNER, M.D.

ANESTHESIA

Desmarest, E., and Jacquot, G. Is It Possible to Evaluate the Operative Risk and Select the Best Anesthetic by Means of New Tests? (Peut-on, à l'aide de tests nouveaux évaluer le risque opératoire et choisir l'anesthésie la plus indiquée?) *Anes et Anal*, 1938, 4, 60

Desmarest and Jacquot note that the anesthesia employed is an important factor in determining the prognosis of an operation. In selecting the anesthetic it is important to know the state of the cardiovascular function. The tests described by Crampton, and by Barach and Moots have been used in the last year in surgical patients in an attempt to determine the cardiovascular condition before operation.

With Crampton's test the vascular tonus is measured by comparing the systolic pressure when the patient is recumbent with that when he has been in the erect position for two minutes. If the pressure falls, this is an unfavorable sign, if it remains stationary or rises, it is a favorable sign. An acceleration of the pulse rate after two minutes in the erect position is also an unfavorable sign, the greater the acceleration is, the worse the prognosis. If there is little or no acceleration of the pulse, the patient is a good surgical risk. Crampton has published a table the abscissas of which show the variations in the systolic pressure, the table ordinates the variations in the pulse rate. Crampton's index can be determined for each case. In this table 100 represents theoretical perfection, 75 is excellent, 65 moderately good. The lower the index is, the less favorable the prognosis for operation. The index may be a minus value, the authors had one case with a -75 index in a cachectic patient with cancer of the stomach. An illustrative case shows the use of this table.

In a young man twenty-five years of age, to be operated on for inguinal hernia, the systolic pressure was 12 cm (Hg) in the recumbent position and after two minutes in the erect position, 13 cm, which showed an increase of 1 cm mercury. The pulse rate in the recumbent position was 72, after two minutes in the erect position it was 86, an increase of 14. In the table, the column for 1 cm increase in pressure followed downward to the horizontal line corresponding to an increase of 24 in the pulse rate gave an index of 75, showing the patient to be in excellent condition for operation. On the other hand, in a patient of sixty-seven with cancer of the stomach, the systolic pressure diminished 4 cm. (Hg) and the pulse rate increased 24, which gave a Crampton index of -50 and indicated a very unfavorable condition.

In 113 cases in which the Crampton test was made prior to operation, the index was 75 or more in 65 cases, between 75 and 65 in 13 cases, and below 65 in 35 cases. The patients with an index of 65 or more were all in good condition, and the selection of the anesthetic presented no difficulties. In these cases nitrogen protoxide or cyclopropane was employed, with rectanol as a basic anesthetic if complete muscular relaxation was desired. In cases with an index below +65, the same anesthetics were employed in the more favorable cases, but local anesthesia in the less favorable cases.

The chief objection to Crampton's test is that with some patients it is impossible to keep them in the erect position for two or three minutes. For them the index of Barach may be employed, which is determined by multiplying the figures for the systolic pressure and the diastolic pressure taken in the recumbent position by the pulse rate and adding the two products, to be of favorable prognosis the index should be between 1,300 and 2,000. Moots' "index of operability" is the ratio of the differential pressure between the systolic and diastolic pressure to the diastolic pressure, this should be between 25 and 75 per cent, if the patient is operable, values below or above are unfavorable. In cases of hyperthyroidism, Bartlett's breathing test may be employed.

If these tests show that the cardiovascular function is deficient and there is no emergency, operation should be deferred, and the patient given suitable preparatory treatment. If the condition does not respond to this treatment, it is better to avoid operation entirely, unless it is absolutely necessary, if operation is necessary, the anesthetic that is the least toxic should be employed. ALICE M. MEYERS

Weese, H.: The Problem of Narcosis with Fluid Anesthetics (Considérations sur le problème de la narcose par les anesthésiques liquides) *Anes et Anal*, 1938, 4, 1

Weese notes that until recently general anesthesia was induced only by inhalation, but at present the use of fluid anesthetics given in solution by intravenous injection or by rectum is receiving considerable attention.

SURGICAL TECHNIQUE

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Bookless A S Uremia After Hemorrhage *Guy's Hosp Rep Lond 1938 88 22*

Gastric uremia following gastric hemorrhage is said to be fairly common. In the cases of 13 patients there was a marked increase in the blood urea, and in 5 it proved to be fatal. In these the urea continued high. In the cases of patients showing recovery the urea was high at first but a decrease was noted with clinical improvement in the patient. Though the blood urea begins to rise shortly after the occurrence of gastric hemorrhage the clinical symptoms do not appear for a day or so or until the period of secondary hemorrhagic shock. This is due to fluid starvation or recurrent bleeding or both and the patient's condition becomes worse rapidly the pulse tension and the output of urine are diminished. The lowest blood urea coincident with toxic symptoms was 290 mgm. per 100 c.c.m.

The author believes that uremia following gastric hemorrhage is due mainly to increased breakdown of the tissue protein. This process is rapidly increased by sudden loss of blood and is maintained or accelerated by dehydration. Sometimes absorption from the bowel oliguria or renal depression may augment the uremia.

The objects of treatment are to stop hemorrhage and to combat secondary collapse as indicated by a raised blood urea. All of the patients were starved by mouth for twenty-four hours although 10-ounce saline infusions were given by rectum at intervals of four hours. Graduated milk and water feedings were given during the next four days and on the sixth day the first stage of a standard ulcer diet was begun. Transfusion was needed only for severe anemia severe dehydration and before operation.

JOHN WILKIE EYTON, M.D.

Hageman P O and Blake F G Clinical Experience with Sulfanilamide in the Treatment of Beta Hemolytic Streptococcal Infections *Am J M Sc 1938 195 103*

The authors report a series of 114 consecutive cases of beta hemolytic streptococcal infection in patients who were treated with sulfanilamide. The oral administration of sulfanilamide seems to be the best method and the authors feel that parenteral administration is indicated only when oral medication is impracticable. In the cases reported the dose by mouth was 5 gm. per day for each 20 lb. of body weight up to 100 lb. divided into 4 doses which were given at six-hour intervals but not more than a total of 5 or 6 gm. per day for persons weighing more than 100 lb. It is believed that 5 gm. per day represent the maximum therapeutic dose of sulfanilamide to be given orally per day.

Twenty-seven cases of erysipelas treated by other methods in the New Haven Hospital New Haven Connecticut between January 1, 1936 and January 1, 1937, were reviewed, and the results were compared with those obtained in the cases treated with sulfanilamide. The duration of the disease was thirteen and nine tenths days in the control group as compared with five and three tenths days in the group treated with sulfanilamide. Spread of the disease was noted in 65 per cent of the control series while only 11 per cent of the treated series showed more than slight marginal spread.

In a group of 7 cases of pneumonia, 3 of the patients had had purulent complications at the time treatment was begun. In these cases the course was noticeably more protracted with one exception. In 2 of the patients the condition subsided without surgery while in 1 a thoracotomy was necessary even though the pleural exudate had become sterile. In this case and that of 2 others treated subsequently the course of streptococcal empyema seemed to have been transformed into a subacute inflammation in which considerable organization thickening of pleura and contraction of the chest created therapeutic problems of considerable significance. The remaining cases had no purulent complications at the onset and developed none after treatment with sulfanilamide was started. Recovery in these cases was more prompt and all of the patients recovered.

Among 5 cases of meningitis there were 2 recoveries these represent the only patients who have survived a beta hemolytic streptococcal meningitis in this hospital in the past ten years.

In a group of 15 cases of mastoiditis only 2 patients required mastoidectomy after treatment with sulfanilamide was started. All of the patients recovered.

Eleven cases of otitis media subsided without developing a discharge. In the case of one patient relapse occurred but the discharge promptly subsided when sulfanilamide was given. Mastoiditis or other infectious complications did not develop in any instance after treatment was started. All of the patients recovered.

Seven patients with scarlet fever were treated with sulfanilamide. 4 of them received no serum. The toxic phase of the disease seemed unaffected by the sulfanilamide. There were however no septic complications in this group.

Of 15 patients who were treated for lymphadenitis only 2 required surgical therapy after treatment was started and one of these had a mixed infection. Adenitis recurred in 2 cases but both patients responded satisfactorily to sulfanilamide.

Sixteen patients with pharyngitis and toxic adenitis responded fairly promptly to treatment with sulfanilamide and none of them developed infectious complications.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Orr, C. R., Popoff, G. D., Rosedale, R. S., and Stephenson, B. R.: A Study of the Effect of Thorium-Dioxide Sol Injected in Rabbits *Radiology*, 1938, 30 370

The large number of recent contributions to the literature suggesting the use of radio-active substances as a diagnostic therapeutic measure prompted the authors to investigate the latent effects of thorium-dioxide sol upon experimental animals. As an introduction to their study, they discuss at some length the radio-activity of thorium-dioxide sol as revealed by reports from various sources. They also review the literature of its effects as reported by numerous authors, and cite 36 articles listed in the bibliography favoring its use, with very little mention of any possible danger. The work of others who have arrived at contrary conclusions is also given due consideration.

Two methods of approach were used in this study:

1. Experimental animals were injected with the sol and detailed microscopic examinations made of the reticulo-endothelial structure after periods of from twenty-four hours to three hundred and eighty-five days.

2. Roentgen-ray films were exposed to prepared ampules of the sol, to dried specimens of the liver and spleen, and to histological sections in an effort to demonstrate radio-activity. The purpose of the investigation was to determine (1) the site of storage, (2) the delayed effect on body tissue, (3) the degree of radio-activity, (4) the rate of elimination, and (5) the route of elimination.

Detailed data of the experimental procedures are given together with the radiological and pathological findings. Results of the study are summarized:

1. Injected thorium is engulfed by the reticulo-endothelial system, i.e., the reticulum cells of the splenic pulp, lymphatic tissue, and bone marrow, the endothelial cells of the liver capillaries (Kupffer cells), lymph sinuses, splenic sinuses, bone marrow, and suprarenal capillaries, and the phagocytic cells in connective tissue.

2. There has been no evidence of elimination of this substance from the body during a four-year period of observation. This apparently results in a permanent blockage of the reticulo-endothelial system, and may thus impair its immunological properties.

3. Thorium-dioxide sol has been demonstrated, by means of shadowgrams, to be definitely radio-active both in prepared ampules and when engulfed in body tissues. Even minute amounts of injected tissue have been shown to be radio-active by means of histoshadowgrams and by the spinthariscopes. The use of filters has shown that both alpha and gamma radiation is present.

4. The following histological changes have invariably been found:

- a. The reticulo-endothelial system phagocytoses the thorium dioxide.

- b. The liver shows pathological changes varying from simple cloudy swelling to profound necrosis and depending upon the dose. These changes are followed by the proliferation of fibrous tissue, which presents a picture similar to mild nodular hyperplastic cirrhosis.

- c. The spleen shows damage varying from degeneration of the lymph follicles to marked necrosis, even of the vessels and interstitium.

- d. The bone marrow contains large clusters of thorium and shows hematopoietic depression.

- e. The lung histocytes contain thorium with no definite tissue damage.

- f. The adrenals contain thorium in the reticulo-endothelial cells. There is questionable degeneration of the cortical cells in the zona glomerulosa.

In conclusion the authors state their belief that thorium-dioxide sol should not be injected into human beings because:

1. It is not eliminated from the body.

2. It apparently blockades the reticulo-endothelial system and may thus adversely affect some of the body's immunity mechanism.

3. It may, as in their experimental animals, profoundly damage the parenchyma of the liver and spleen, with early and late degenerative changes.

4. It is a radio-active substance, and undoubtedly has dangerous cumulative radio-active effects.

ADOLPH HARTUNG, M.D.

Dresser, R., and Spencer, J.: Physical and Clinical Observations on the Use of Million-Volt X-Rays. *New England J. M.*, 1938, 218 415

A new type of x-ray generator, operated routinely at a constant potential of 1,200,000 volts, has been used by the authors for six months in the treatment of malignant conditions and in carrying on certain physical investigations, the results of which are reported in this article. The average wave length produced by it approaches that of the rays of radium. The quantity of radiation has been estimated to be equivalent to that which would be obtained from 2,000 gm of radium element. The apparatus has been found to be as reliable mechanically as any of the low-voltage commercial x-ray units.

The authors have found that the skin will tolerate twice as much x-ray irradiation delivered at 1,000,000 volts, as it will at 200,000 volts. Moreover, if equal doses of 200,000-volt and 1,000,000-volt x-rays are applied to the skin, about 20 per cent more of the latter will reach the center of the body. The combination of these two factors, that is, the greater skin tolerance and the greater penetrating power, allows the administration of more nearly adequate

With ether as typical of inhalation anesthesia, high concentrations must be used to induce anesthesia rapidly after satisfactory anesthesia has been established lower concentrations may be employed. Inhalation anesthesia is controllable because inhalation can be stopped at any point and the patient then exhales the excess ether. The margin between the fatal dose of ether and the dose necessary to obtain complete narcosis is slight as determined by the concentration of ether in the venous blood, the fatal dose is from 1.4 to 1.6 times that of the narcotic dose.

The rapidity of absorption of avertin given by rectum depends upon whether it is absorbed entirely through the rectal mucosa or partly through the mucosa of the large intestine. The rapidity of absorption of avertin and the initial concentration of the drug in the blood vary in each case. The duration of anesthesia with avertin depends upon the balance maintained between its absorption, its diffusion in the tissues and its elimination. The liver is the organ chiefly responsible for the destruction and excretion of avertin and hence it is excreted gradually. Because avertin is absorbed slowly and its absorption cannot be stopped after it is once begun, its absorption cannot be controlled as with inhalation anesthesia. The margin between the fatal and the narcotic dose of avertin has been found to be about the same as that of ether. Motor excitation and vomiting are rarely observed with avertin anesthesia.

With liquid anesthetics administered by intravenous injection the effect depends upon the rapidity of the injection. The two anesthetics most fre-

quently employed for intravenous injection evipan and pernocton which are both barbiturates are also excreted by the liver and are gradually excreted. These barbiturates when injected intravenously have an immediate effect, and the dosage employed and the rapidity of the injection must be determined by the reaction of the patient. From the author's determination of the concentration of evipan in the tissues of experimental animals he concludes that evipan, and probably also pernocton is rapidly diffused in the tissues. Pernocton is less rapidly broken down by the liver and hence less rapidly excreted than evipan, and anesthesia is therefore more prolonged with pernocton. The margin between the fatal and the narcotic dose of evipan is considerably greater than that of ether and avertin but with pernocton it is about the same as with avertin while with both the latter drug the anesthesia may be prolonged. Evipan and pernocton in toxic doses act primarily upon the respiratory center not on the circulation artificial respiration may be used to overcome this toxic effect, as with inhalation anesthesia.

Avertin and pernocton may be used as barbiturates supplemented by inhalation anesthesia. However, evipan with its higher margin of safety may be used without supplementary anesthesia when the operation is of short duration. For longer operations inhalation anesthesia must be employed with evipan. To prolong the anesthetic effect of evipan repeated small injection may be given. A review of statistics from the world literature shows that the mortality from evipan anesthesia is very low and is being still further reduced.

ALICE M. MEYER

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

MacCollum, D. W.· Wringer Arm. *New England J M*, 1938, 218 549

The author reports a series of 26 cases of wringer arm injury. This type of injury is seen in all age groups, but it occurs most frequently in early childhood. The child's finger is caught in the rollers of the electric wringer and the entire arm is pulled along with such force that the child is unable to extricate himself. Usually, the rollers continue to churn away until the motor is stopped or the safety release is applied.

Twenty-two of the 26 patients in this series were children between the ages of two and five years. The extent of their injuries was variable, no nerve lesions were seen and only 2 minor fractures occurred. The primary trauma was to the skin, the subcutaneous tissues, and the muscles. In each instance there were marked ecchymosis, edema, and abrasions of the skin. Three patients received lacerations which required suturing, and in 7 patients the trauma was sufficiently severe to cause necrosis of the skin and underlying tissues.

When such accidents occur, the arm swells immediately and the intact skin becomes blotchy. The extent of injury to the soft parts cannot be properly evaluated at the first examination and, because of the swelling, examination for fracture is difficult. For this reason a roentgenogram should be taken in every case of wringer arm injury.

In the treatment of a fresh injury, the first procedure should be immobilization by means of a sling or sand bag. Edema must be reduced, and the author advises the application of ice packs for twenty-four hours and alternate hot and cold packs the second day. A rigid aseptic technique must be carried out in the treatment of abrasions, to prevent the development of sepsis in the devitalized tissue.

In cases of patients seen several days after the occurrence of the injury, either the entire arm is found to be swollen, red, and painful, with evidence of cellulitis, or an area of necrosis has developed. The cellulitis is treated by the continuous application of hot packs, plus general care for improvement of the patient's condition. If necrosis has developed, further treatment is necessary. Necrosis is slow to develop and, as noted above, occurred in 7 of the author's patients, only 1 of whom was seen shortly after the accident.

The author believes that if the treatment outlined for fresh injuries is carried out, a minimal amount of sloughing will occur. If the injured tissue does not respond to efforts to revive it, the gangrenous area will soon become demarcated. Because it is impossible to judge the depth of the necrosis, caution against the removal of this slough is advised, and

continuous soakings to accomplish its removal are suggested. Following removal of the dead tissue, the site is usually found to be cratered and covered with chronically infected granulations. The covering of these raw areas with epithelium in the form of thick razor grafts is advised, and if contractions develop later, a plastic procedure can then be accomplished in an aseptic field, at a more advantageous time for good healing. It must be remembered that these are crushing injuries and that extensive injury to the tissue surrounding the granulating area has occurred, which must be covered by grafts. It is necessary therefore to hasten the formation of healthy granulation tissue. The author's method of treatment consists of daily hypertonic baths, and the application of wide-mesh paraffin gauze covered by sponges which have been soaked in eusol, and held firmly by elastic bandages. When the raw area has become cherry pink and the condition of the patient is sufficiently improved to withstand operation, the grafts may be applied. The author describes briefly a technique for razor grafting.

HARVEY S. ALLEN, M.D.

Burrows, H. J.: The Developmental Abbreviation of Terminal Phalanges. *Brit J Radiol*, 1938, 11 165

The author describes 3 cases of developmental abbreviation of the terminal phalanx of the thumb. This is a rare condition and only a few cases have been previously reported. The literature is summarized and the condition is discussed.

Most of the reported cases and 2 of the author's show involvement of the terminal phalanx of the thumb alone. A few show similar changes of the terminal phalanges of the other digits. There is no associated disability. The pathology of this condition is essentially shortening of the shaft of the terminal phalanx. The nails are short and perhaps broadened. The soft tissue of the terminal segment



Fig 1 Hands of the patient.

amounts of radiation to deep seated tumors without appreciable damage to the superficial tissues. Also surprisingly little roentgen sickness has been noted following million volt therapy.

It is the authors' impression that satisfactory results are to be expected only in those tumors which have shown themselves to be in some degree sensitive to low voltage radiation. However, a case of laryngeal carcinoma is cited in which treatment by the supervoltage method produced strikingly favorable results after treatment with radium implantation and after heavy doses of 200,000-volt roentgen rays had failed to check the progress of the disease.

A brief analysis of the cases of 101 patients who received 84 treatments during the first six months the machine was in operation is given. The cases are tabulated as to lesions treated. Patients treated for breast tumor reacted much the same as those treated with lower voltages except that there was less skin reaction and roentgen sickness. Laryngeal lesions also developed much less superficial reaction which the authors believed to be a decided advantage in that radiation could be repeated after several months, if indicated. Bladder tumors yielded much more favorable immediate results, partial or total regression with symptomatic relief occurring in almost every instance. Much palliation was afforded in all patients with carcinoma of the prostate but in no instance was there complete disappearance of the neoplasm. One patient with carcinoma of the esophagus became symptom free, gained weight and presented a normal esophagus roentgenologically.

Observations thus far lead the authors to believe that in the treatment of deep seated neoplasms the immediate results of 1,000,000 volt x-ray therapy even though they may prove to be only palliative are superior to those obtained with lower voltages.

ADOLPH HARTUNG, M.D.

MISCELLANEOUS

Vallebona, A. and Benvenuto, G. The Effect of Short Wave Therapy upon Cutaneous Reactions Produced by Ultraviolet and Radium Rays (*L'influenza della macroterapia sulle reazioni cutanee da raggi ultravioletti e da raggi del radium*). *Radiol. med.* 1933 25 277.

Vallebona and Benvenuto review briefly the literature concerning the biological effects obtained by the combined actions of certain physiotherapeutic agents with special reference to the action of short

wave therapy upon certain cutaneous reactions produced by ultraviolet and radium rays. In a further study the author substituted infra red rays in place of short wave therapy. In general the effects obtained in each case were studied with reference to the time at which short wave therapy was instituted and the time that actinotherapy was instituted.

This study embraces a long series of observations from which Vallebona derives the following conclusions:

In combining short wave therapy with ultraviolet irradiation certain biological reactions are obtained the intensity of which depends primarily upon the relative order of administration of the two named physiotherapeutic agents.

The most intense reactions are obtained when ultraviolet irradiation is followed immediately by exposure to short waves. The intensity of the reactions gradually decreases (in the order given) if short wave therapy is followed immediately by exposure to ultraviolet rays and if exposure to ultraviolet rays is followed in two hours by short wave therapy. The least intense reactions are obtained when ultraviolet rays and short wave therapy are given simultaneously. All the aforementioned biological reactions however are more intense than those obtained with ultraviolet irradiation alone.

In studying the combined effects of ultraviolet and infra red rays Vallebona and Benvenuto found that variable results are obtained. No definite conclusions may be drawn from their series of observations and in agreement with other investigators the author states that it is yet highly problematical whether these two physiotherapeutic agents possess a mutually antagonizing or a synergistic action.

In considering the combined effects of radium rays and short waves the authors found that (a) radium irradiation followed immediately by exposure to short waves yields more intense reactions than exposure to short waves followed immediately by exposure to radium rays; (b) the application of radium rays followed in successive days by exposure to short waves yields more intense reactions than the simultaneous application of both agents; and (c) the simultaneous application of radium rays and short waves yields more intense reactions than radium rays alone.

From this study the authors conclude that short waves have a distinctly sensitizing action upon cutaneous reactions produced by actinic irradiation. The biological action should be thoroughly investigated and its potential value in the treatment of neoplasms should be considered.

RICHARD E. SOMMER, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

OCTOBER, 1938

PRINCIPLES OF SURGICAL PRACTICE

WATER AND SALT METABOLISM

SAMUEL STANDARD, M D , F A C S , New York, New York

MEDICINE has been taught in various ways. Arbitrary classifications have been set up for purposes of convenience, the convenience of teaching, of investigation, or of therapy. We now have systems of medicine with gross divisions into pulmonary, gastro-intestinal, and genito-urinary diseases, each system being treated as an entity in itself. Hutchins (41), in his address before the American College of Surgeons, pointed out that the whole is not always the sum of its parts. With this truism in mind, it might not appear illogical to teach medicine in terms of fundamental derangements seen in a cross section of all systems affected. Derangements in the mechanisms that control the constant factors in the body offer such an approach to the study of medicine. Of greatest importance to the well being of the body is the maintenance of a constant internal environment. The concept of the constancy of the internal environment first advanced by Claude Bernard has been amply substantiated by Cannon and his co-workers (12). Among the so-called steady factors in the body is the effort it exerts to maintain a constant ratio between the fluids and solids of which it is composed.

The wealth of recent literature that has sprung up on the subject of water metabolism may be taken as an index of our growing understanding of its importance in the proper functioning of living matter. The basic nature of the problem may be inferred from the diversity of interests focused upon it. The chemist and the physiologist have clarified some of the details of the intrinsic mechanisms utilized by the body in the handling of water in the normal state and in the abnormal states of water loss, deprivation, or overabundance. The medical clinician and the

surgeon have been learning to apply this newly acquired knowledge at the bedside and in the operating room.

The subject is a large one, so for purposes of clarity it will be treated under a classification which will have the advantage of isolated discussion of each principle involved with the recent literature supporting it.

GENERAL OUTLINE

- 1 The normal water content and its relationships in the body
- 2 Clinical diseases in which salt and water derangements contribute significantly to the morbidity or mortality of the underlying disease, and the physiological mechanisms underlying each type of derangement
- 3 The intrinsic compensatory efforts of the body to maintain the "constant factors" in water and salt relationships, the rôle of the lung, gastro-intestinal tract, and kidney, in the normal and in the above derangements. What circumstances are responsible for failure of the intrinsic mechanisms and what are the principles involved in replacement therapy when intrinsic efforts fail?
- 4 Details in materials, methods, and mechanics used in replacement therapy and indications for their use
 - a Materials: blood, water, glucose, saline solution, acacia, Ringer's solution, Hartman's solution and lyophile
 - b Routes: mouth, rectum, and subcutaneous and intravenous routes
 - c Mechanics, duodenal tube and rectal tube. Forms of containers, and dispensers for clysis and infusion. Speed, temperature, duration of infusions, and amount



Fig. 2. Skiagram of the hands

of the thumb is thickened. Most cases show a familial tendency and their genealogy is shown.

The incidence of this condition is believed by some to be about 1/4 per cent of all hands examined. No racial tendency is apparent and the two sexes are about equally affected. The author believes the ratio of bilateral to unilateral appearance is about 2 to 1. The age of onset cannot be determined. This condition in the majority of instances is unassociated with other deformities. A few cases from the literature have shown a similar condition of the toes, shortened middle phalanges or short metacarpal bones.

The author discusses the cause of this condition which seems to be associated with a tendency to premature fusion of the epiphyses of the affected phalanges. He concludes that there must be some common factor which is responsible for both the initial shortening and the premature fusion of the epiphyses.

HARVEY S. ALLEN, M.D.

Tochtrop, G. Latent Gas Bacillus Infection (Beitrag zur ruhenden Gasoedeminfektion). Muenster Dissertation 1937.

The incubation period of gas bacillus infection can be limited according to Hænken to three weeks. After that time one should speak of latent infection. Gas bacillus infection is not necessarily associated with gas gangrene. Marwedel found gas bacilli in 72.7 per cent of 72 war wounds and none of the patients developed gas gangrene. The bacilli pathogenic for man according to Zeweler, are listed in the following order: (1) Welch Fraenkel, (2) Novy's bacillus of malignant edema, (3) *Vibrio septique*, and (4) *bacillus histolyticus* which is only pathogenic in symbiosis with the others, but not by itself.

The clinical picture is described. Emphasis is placed on the initial pain which has its location in the musculature. The division into epifascial and subfascial forms according to Payr is discarded as is also the division into blue and brown forms.

Twenty-five cases of latent infection are collected from the literature. The duration ranged from 12 weeks to eighteen years. The condition always became manifest after operation. Eleven or 44 per cent of the patients died. Those treated with serum showed a mortality of 14.3 per cent, those that did not receive serum a mortality of 38 per cent. In 3 cases a primary infection occurred immediately after the gunshot wound. Gas bacilli were found bacteriologically 11 times. In the other cases cultures were negative or were not made. Since latent infection is to be feared even after many years prophylactic gas bacillus and tetanus serum should always be given before operations following gun hot injuries are performed.

(FRANZ) LEO M. ZIMMERMAN, M.D.

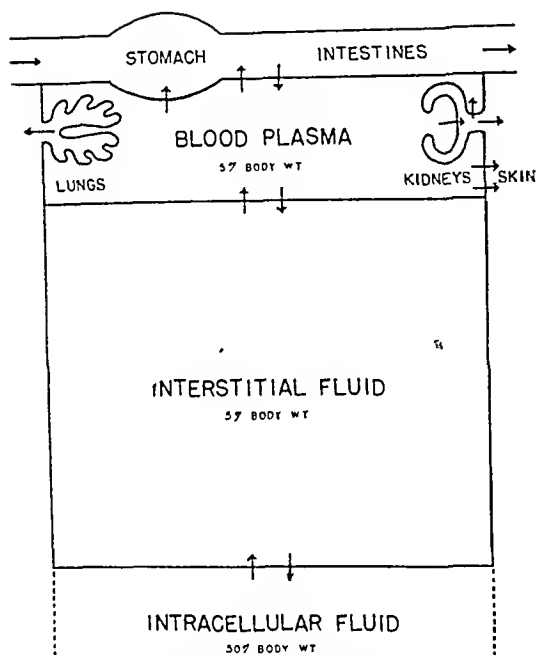


Fig 1 The fluid reservoirs of the body illustrating avenues of fluid intake and loss From Gamble (16)

to heat This abnormal loss of water, as will be pointed out later, may reach critical heights Men, working in hot environments, have been known to lose from 8 to 10 liters of water a day by this route

In normal states, the water intake may be considered adequate if it reaches 3,500 c cm a day This allows 1,500 c cm for urine and 2,000 c cm for insensible cutaneous loss

The water-salt ratio The heading just discussed was called the fluid-solid ratio The word "fluid" was used rather than "water," since the tissues cannot handle, and do not come in contact with, distilled water, but rather with a fluid having dissolved in it definite concentrations of colloids in the form of proteins and crystalloids The ratio between solvent and solute is carefully maintained at a constant value, and even small alterations in this constant produce marked derangements in physiological function The most important step forward in our understanding of the chemical anatomy of the body fluids was taken by Gamble and McIver (27, 28) when they demonstrated the almost identical chemical structures in the blood plasma and the interstitial fluid, the similarity in ionic concentration to intracellular fluid, and the very close resemblance

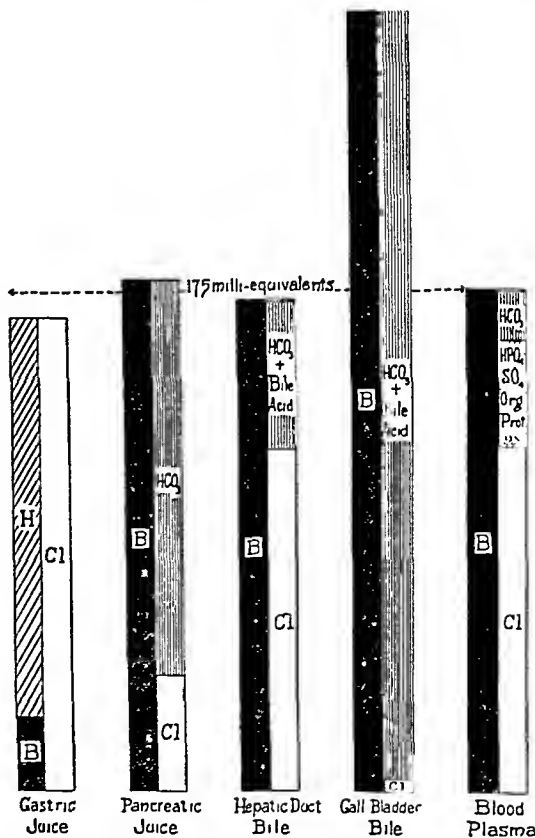


Fig 2 Inorganic composition of digestive juices, illustrating the similarity of the total electrolyte concentration of all except gall-bladder bile to that of plasma From Gamble and McIver (13)

of the gastro-intestinal secretions to both of these (Fig 2). The predominating base in extracellular fluid is sodium, in intracellular fluid, potassium However, the ionic concentrations of each is similar to the other The ionic concentration is the equivalent of an 85 per cent sodium-chloride solution This has been called "physiological saline" The other crystalloids each play a rôle in plasma, but quantitatively the sum of all the rest constitutes less than 10 per cent.

Smith (71) points out that the kidney has more to do with the maintenance of a constant concentration of dissolved substances in the plasma than with mere volume changes in it; i.e. it is more the custodian of the water-salt ratio than the fluid-solid ratio

The acid-base balance With the introduction of the salts in solution, a third inescapable factor presents itself for consideration, namely, the con-

- 5 Complications following parenteral therapy
 - a Chill, fever local infection, and phlebitis
 - b Water retention and edema (pulmonary, serous, skin) due to salt retention, protein loss and capillary paralysis
 - c Methods of overcoming retention of fluids, administration of distilled water, hypertonic glucose or sucrose solution transfusions and acacia
- 6 Conclusions

The importance of maintaining a constant water balance is appreciated when the effect of the deprivation of water is compared with that of food. In starvation (66) an animal can lose 40 per cent of its weight as protein and all of its glycogen and fat and still live, whereas the loss of 10 per cent of its water content results in serious disorders and a loss of 20 per cent in death.

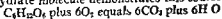
THE NORMAL WATER CONTENT AND RELATIONSHIPS IN THE BODY

For purposes of discussion this subject will be divided into three parts: the fluid/solid ratio, normal fluid 70 per cent, the water/salt ratio, normal equivalent 85 per cent sodium chloride, and the acid base balance, normal pH 7.4.

The fluid/solid ratio. The water content varies for different tissues and for the same tissue under differing metabolic activities or exposure to changing temperatures (5). For the body as a whole, this too too solid flesh of Hamlet's is not nearly as solid as he thought being only 30 per cent solid and 70 per cent fluid. This 70 per cent is distributed in three large reservoirs as indicated in Figure 1. Note that only 5 per cent of the body weight consists of blood plasma, 15 per cent of extracellular or interstitial fluid, and 50 per cent of intracellular fluid. Note too that there is no irreversible intake of fluid but there are four irreversible avenues for loss of fluid, namely: the intestinal tract, evaporation by way of the lungs, insensible perspiration and sweating by way of the skin, and elaboration of urine by way of the kidneys.

The intake is supplied by ingestion and alimentary absorption. The amount of fluid taken is determined by a vague reflex we term pharyngeal thirst. Nowhere is the delicate balance of intake and output better demonstrated than in the matter of fluid ingestion, distribution and excretion.

A second source of fluid is that produced by the oxidation of hydrogen within the body. The reaction of the complete combustion of a carbohydrate molecule demonstrates this source:



This water of oxidation differs for each type of food metabolized (15). The oxidation of 1 gram of protein yields 0.4 gm of water, of carbohydrate 0.6 gm, and of fat 1.07 gm of water. It happens that oxidation produces water nearly in proportion to the caloric value (1), it yields from 10 to 15 gm of water per 100 calories. Thus on an average 2,500 to 3,000 calories daily diet, the water of oxidation would contribute from 250 to 450 gm of water a day. Although not a large amount, it becomes important in starvation such as occurs postoperatively and should be taken into account in replacement therapy.

The avenues for the excretion of fluid are indicated in Figure 1.

Urinary excretion amounts to approximately 1 c cm of water a minute or a total of some 1,500 c cm a day. The minimum fluid requirement by the kidney for adequate excretory function is determined by its ceiling of concentrating power. The last stand of a failing kidney is its ability to put out a large volume of urine at a fixed low specific gravity. In such a case mere volume output is no index of adequate excretory function. Thirty-five grams of waste product are brought daily to the kidney for excretion. A normal kidney which can concentrate to a specific gravity of from 1.030 to 1.035 requires a minimum of 600 c cm of finished urine a day for adequate function. Alteration of the acid base balance may occur and blood retention of waste products does occur when the urine flow falls below 600 c cm a day for several days. In states of dehydration the urine flow falls significantly, and functional kidney failure is an important contributing factor in morbidity and may be a critical factor in mortality.

Pulmonary excretion of water. The expired air carries away as much water as is required to saturate it at body temperature. Normally this amounts to about 300 c cm a day.

Fecal loss of water is trivial, rarely exceeding 200 c cm a day.

Insensible cutaneous evaporation. This is not the same mechanism as sweating. Insensible cutaneous fluid loss is calculated from 1,000 to 1,500 c cm a day. Adolph (1) places the maximum as below 1,000 c cm and states that limitation of water intake or dehydration appreciably diminishes this amount. Collier and Maddock in more recent work (13, 48, 14) find this loss a fixed quantity, relatively little affected by rates of dehydration.

Sweat. Sweat glands are inactive under basal conditions and function mainly as an emergency measure for heat loss during exercise or exposure

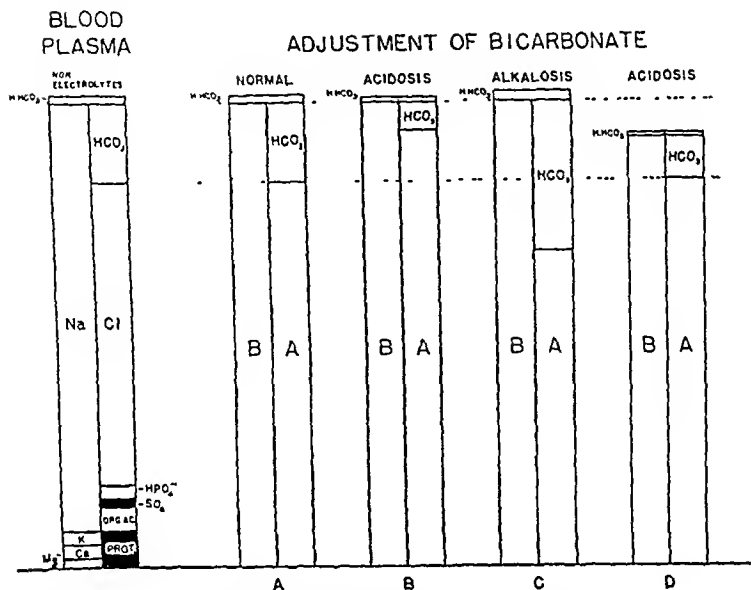


Fig 3 Illustrating the "mendant" position of bicarbonate in rearrangements in the acid-base balance From Gamble (16)

to the new and reduced blood volume. If that were all of the mechanism involved it would be difficult to explain the constant finding of a reduced red blood count and hemoglobin in hemorrhage. Yet these are always found. The answer to this is best demonstrated when a dog is bled rapidly after his blood volume has been calculated. It is found that within a period of from one-half to one hour one can bleed from 2 to $2\frac{1}{2}$ times the calculated volume. The latter blood, however, can be readily recognized as being only highly diluted water with a tinge of red in it, i.e., the vascular bed has absorbed fluid from the surrounding tissue to increase the blood volume. Since the loss has been blood and the replacement saline solution, the cellular elements per unit volume have been reduced and give the characteristic blood picture.

Clinically the patient in shock and the patient in hemorrhage cannot be differentiated. Both are pale, air hungry, and usually conscious, and both have a rapid, thready pulse and an unobtainable blood pressure. Yet the one laboratory finding mentioned above will help differentiate pure hemorrhage from pure shock. In shock there has been a loss of circulating blood volume and the blood has been pooled in the capillary bed because of a capillary paralysis. The arterioles are constricted and although there has been no

loss of whole blood out of the vascular bed the stagnation of blood in the capillaries reduces the circulating blood volume.

The blood count in such a case is found to be high, either normal or above normal. The answer to this hemoconcentration lies in the added derangement in the fluid content of the blood. Either because of the capillary paralysis or perhaps the same factor which produces the capillary paralysis (histamine?) has also changed the permeability of the capillary wall, there has been an exudation of fluid from the vascular bed into the surrounding tissue which left behind a more concentrated blood. The loss is not whole blood but serum. Thus, a simple laboratory test differentiates the two diseases when they occur as separate entities, a differentiation impossible by ordinary clinical examination. This differentiation is of more than academic interest since, for example, a case of ruptured spleen bleeding into the peritoneal cavity must be differentiated from traumatic shock without hemorrhage, because in the former operation is inevitable, and in the latter it may prove fatal.

The shock syndrome should be limited in its definition, if it is to be retained as a distinct entity. The indiscriminate use of the term has robbed it of its original significance. Certain criteria should be fulfilled to warrant its use,

trol of the acidity or alkalinity of the fluid medium. It is beyond the province of this paper to go into the chemical details responsible for the alterations in the acid base balance. Suffice it to say that the normal hydrogen ion concentration, pH 7.4, is maintained by the constant relationship of the bicarbonate ion to the carbonic acid. Under normal circumstances this ratio is provided by a plasma concentration of 3 volumes per cent carbon dioxide as free carbonic acid and 60 volumes per cent as bicarbonate. As long as this 1 to 20 ratio is maintained the pH remains unchanged.

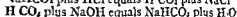
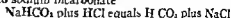
Theoretically changes may occur in the concentration of either bicarbonate or carbonic acid. The concentration of free carbonic acid is controlled by the respiratory mechanism and so excellent is this control that abnormalities due to an incorrect concentration of carbonic acid are almost never encountered. Dislocations in the direction of acidosis or alkalosis are almost always due to changes in the bicarbonate ion. Such a change in the bicarbonate ion is an event which is always secondary to a change in some other part of the electrolyte structure. Gamble (25) speaks of the "mendicant position of bicarbonate, since its value depends on the extent to which the fixed base stands above the sum of the concentration of the other acid radicals. One can almost visualize bicarbonate in the pose of mendicancy: head bowed, palm upturned, never knowing whether it will receive alms or be deprived of the little it possesses, and yet having no independence of action or redress in either instance."

Figure 3B shows this plainly. When acids increase, be they chlorides, sulfates, phosphates, ketone acids in diabetes or starvation or lactic acid in muscular exercise, they deprive bicarbonate of base (sodium) and produce an acidosis. Bicarbonate is converted to carbonic acid which breaks up into carbon dioxide and water and the former is excreted by the lungs.

When acids decrease (Figure 3C), the base stands above the sum of the concentration of the other acid radicals; it unites with carbonic acid and extends the bicarbonate range with a resultant alkalosis. When the base is lost (Fig. 3D) there is a contraction of the entire electrolyte structure, mainly at the expense of the bicarbonate ion, and an acidosis is produced.

Van Slyk (75) emphasizes the important rôle of bicarbonate and carbonic acid as neutralizing buffers against sudden changes of plasma pH by the accession of strong acid or alkali. Such neutralization is not complete in the sense that

the pH of the solution does not remain entirely unchanged. The fact that acidosis and alkalosis develop is ample proof of this. Yet the change achieved is only a small fraction of what it would be if strong acid or alkali was added to an unbuffered solution. The equations below demonstrate the conversion of such strong acids and alkalis to weaker ones. Hydrochloric acid is changed to carbonic acid and sodium hydroxide to sodium bicarbonate:



In the maintenance of the acid base balance the two most important organs are the lung and kidney. The hydrogen ion concentration is in part regulated by respiration but, as will be shown later, the kidney's contribute to this regulation by secreting variable quantities of bicarbonate and a more or less alkaline urine. In addition, when non-volatile acids are produced during acidosis ammonia is formed for their neutralization in order to conserve the inorganic bases of the blood. Smith (71) states: "One might say that it was only incidentally in the performance of these complex tasks of conservation and regulation that the kidneys carry out their most obvious function, the excretion of the numerous products of metabolism."

CLINICAL DISEASES INVOLVING LOSS OF SALTS AND FLUIDS

These diseases will be considered under three headings: loss of fluid directly from the blood stream, as in hemorrhage and shock; loss of fluid by way of the gastro-intestinal tract; and loss of fluid due to metabolic derangements.

Loss of fluid directly from the blood stream. There is the obvious loss of fluid from the vascular bed associated with hemorrhage and the less obvious loss of fluid from the vascular bed associated with shock. In speaking of hemorrhage there will be included only the sudden severe hemorrhage such as occurs with external trauma and rupture of the large vessels which bleed to the exterior, ruptured ectopic pregnancy, a ruptured spleen, or an ulcer on the posterior surface of the duodenum which erodes through the pancreaticoduodenal artery. The slower oozing from bleeding hemorrhoids or bleeding uterine fibroids is not included in this group.

In hemorrhage there is a loss of whole blood. The intrinsic compensatory mechanisms involve an increased heart rate to compensate for the decreased stroke volume and a peripheral vasoconstriction in an attempt to fit the vascular bed

5 Urea exists in the cases where suppression of urine has been a marked symptom

6 All the salts deficient in the blood, especially the alkali or carbonate or soda, are present in large quantities in the peculiar white dejected matters "

His suggestions for therapy are equally direct, "First to restore the blood to its natural specific gravity (i.e. its water content); second, to restore its deficient saline matters the first of these can only be affected by absorption, by imbibition, or by the *injection* of aqueous fluid into the veins, the same remarks, with sufficiently obvious modifications, apply to the second "

Only a short period removed from the age when all diseases could be cured by "blood letting" this wise physician suggests the diametrically opposite procedure of intravenous infusion Yet a lapse of eighty years intervened before Rogers and Nichols and Andrews used intravenous saline injections with a remarkable decrease in the mortality in the 1909 cholera epidemic in the Philippine Islands

In Figure 4 the six sites lettered represent (a) pyloric occlusion, (b) duodenal fistula, (c) intestinal obstruction in the midjejunum or ileum, (d) fistula at the terminal ileum, (e) tumor of the right side of the colon, and (f) tumor on the left side of the colon or in the sigmoid or rectum

Dehydration with alkalosis (Fig 4a) Pyloric occlusion with vomiting of the gastric secretion and food ingested is seen classically in the congenital hypertrophic pyloric stenoses in infants, in cicatricial contraction of a pyloric ulcer, or in occlusion of the pylorus by a malignant growth Functionally, the same derangement is produced without an organic occlusion, by persistent vomiting in the toxemias of pregnancy, in sea sickness, or in terminal uremia

Hollander (40) has shown that hydrochloric acid is secreted by the stomach at a constant concentration of about .4 per cent Bulger (8) demonstrated the significant fact that the chloride in venous blood from the stomach differed little from that in arterial blood going to it; i.e. chloride and water are removed from the blood for the gastric juice in equivalent amounts The base concentration in venous blood, however, greatly exceeds that in arterial blood

Obstruction at the pylorus results in vomiting of the gastric contents containing some sodium, but far more chloride. (Only in cases of complete achylia, as in pernicious anemia, and in some cases of gastric carcinoma with achlorhydria does the loss of sodium equal the loss of chloride) As the elements in gastric secretion are derived

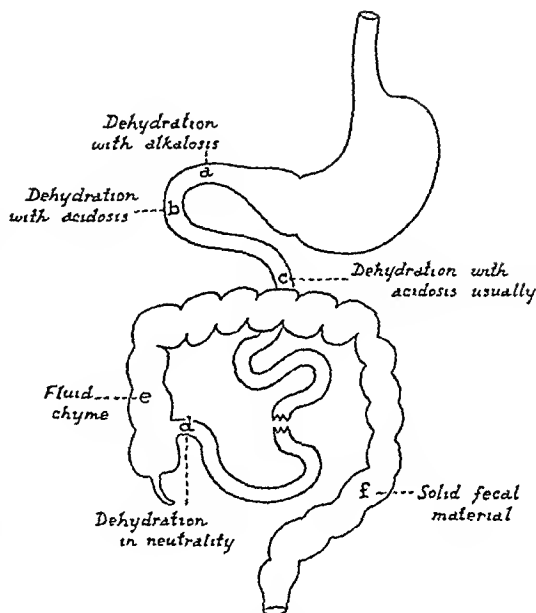


Fig 4 Illustrating (a) pyloric obstruction, (b) duodenal fistula, (c) intestinal obstruction in the midjejunum or ileum, (d) fistula at the terminal ileum, (e) cecum and ascending colon, (f) rectosigmoid

from the body, the result to the organism is the loss of large amounts of water and chloride with a lesser quantity of sodium. The remainder of the sodium which was previously combined with chloride is liberated to combine with carbonic acid to form bicarbonate Consequently the alkali reserve in the plasma increases while the plasma chloride diminishes and a condition of primary alkali excess is produced There is a rise in the pH. The latter may rise from its normal (7.3 to 7.5) to 7.6 or higher and gastric tetany may appear. This is one of the few instances when ketosis due to starvation is associated with alkalosis

Donovan's (18) report on a series of cases of congenital hypertrophic stenosis in children clearly shows the importance of the recognition and treatment of the dehydration and alkalosis in this disease The reduction in mortality is dramatic after the institution of replacement therapy along with the usual surgical procedure, the mortality falling from 25 per cent to practically 0

Yet to this day patients with pernicious vomiting of pregnancy are being given sodium bicarbonate for the "acidosis" supposedly present This can only aggravate the existing alkalemia

these criteria are as follows (1) capillary paralysis, (2) arteriolar competence (3) hemoconcentration, and (4) circulatory collapse of peripheral origin

Heuer and Andrus (39) Sweet (74), and Scudder (68-69) have demonstrated the rôle played by the adrenal cortical hormone in states of shock associated with dehydration, demineralization, tetania, and hyperpotassemia seen in acute intestinal obstruction. They advise its use as an aid in treatment

Moon (51-52, 53) discusses the shock syndrome from the viewpoint of its edema producing and hemoconcentrating tendencies. His work on pulmonary edema following capillary injury by various agents suggests the possibility of local shock in isolated capillary beds

Phemister (60) emphasizes the importance of psychic and intrinsic reflex trauma as a purely neurogenic cause of shock. He recalls the instances of patients who insisted they would die if operated upon and then keep their promise although there was no organic evidence to warn the surgeon of such an outcome. These patients died in circulatory collapse with a typical shock syndrome. (We have seen mild shock incident to dehydration in intestinal obstruction markedly aggravated by the administration of a spinal anesthesia. This demonstrates the importance of arteriolar competence in the true shock syndrome. With the administration of spinal anesthesia the vasomotor spasm which constitutes one of the compensatory mechanisms for maintenance of the circulatory adequacy is abolished. Neurogenic vasomotor paralysis is added to pre-existing volume loss. Complete collapse follows and death may result. In dehydration states with circulatory competence already threatened by a diminished blood volume spinal anesthesia may contribute a dangerous and often lethal component to circulatory collapse.) Phemister mentions too the fall in blood pressure so often seen in gall bladder surgery. Hurst and Rovenstein (11) discuss this clinically and experimentally, prove it to be a reflex from the celiac ganglion which is markedly aggravated by atropin premedication

Blalock (5-6-7-10) offers experimental and clinical support for the theory that shock follows the blood loss by hemorrhage into damaged tissue through injured or leaky vessels. This would fail to explain the shock seen in acute pancreatic necrosis or ruptured peptic ulcer

The treatment of hemorrhage and shock will be discussed later in relation to the various fluid media available. The specific drug therapy is be-

yond the province of this review, and will be mentioned briefly. Adrenal cortical hormone suggested by Heuer, Scudder and Sweet (39-68-69-74) has been discussed. Blalock (6, 7) warns against the use of vasoconstrictor drugs in shock except that caused by vasodilatation. The use of sympathomimetic drugs such as adrenalin and ephedrine, would tend only to further constrict an already adequately constricted arteriolar bed. Adrenalin in pharmacological doses produces hemoconcentration, in toxic doses it can produce the typical shock syndrome. Johnson (44) suggests the use of neosynephrin hydrochloride in the treatment of hypotension and shock from trauma or hemorrhage

Loss of fluid by way of the gastro-intestinal tract
The investigations of Gamble (27, 28, 29-32) have contributed immeasurably to our understanding of the derangements in the water and salt metabolism occurring in gastro-intestinal diseases. Gamble's basic contribution was the demonstration that the total electrolyte concentration per unit of water in all the gastro-intestinal secretions is approximately the same as in the blood serum. These secretions differ from serum and from each other in the varying proportions of individual ions which they contain. Figure 2 demonstrates this

The source of water and salt loss in derangements of gastro-intestinal function can be easily appreciated if one adds up the total volume of secretions poured into the intestinal tract by the various intestinal juices. This averages from 8 to 10 liters a day

In the diagram of the intestinal tract three lesions have been chosen. The first is pyloric occlusion, the second duodenal fistula and the third a fistula of the ileum near the ileocecal valve

The earliest recorded opinion on the importance of water and salt loss in diseases of the gastro-intestinal tract is quoted by Atchley (2). It is a report by O. Shaughnessy during the cholera epidemic in England in 1831. His summary merits repetition here

1. The blood drawn in the worse cases of the cholera, is unchanged in its anatomical or globular structure

2. It has lost a large proportion of its water
1000 parts of cholera serum having but the average of 850 parts of water

3. It has lost also a great proportion of its neutral saline ingredients

4. Of the free alkali contained in health serum not a particle is present in some cholera cases and barely a trace in others

and attribute to it the lethal effects. Infection, toxemia, starvation, ketosis, dehydration, demineralization, hyperpotassemia, azotemia, and alterations in the acid-base balance, as well as the uncertainties of anesthesia, and the dangers of a major surgical procedure come up for consideration. It would be more reasonable to assume that each adds its quota to the morbidity, or to the final mortality, rather than to pick out one of the many and say, "there is the culprit responsible for death."

Although there is a great difference of opinion as to the cause of death, there is a fair unanimity on the therapeutic principles involved in the treatment of the disease. All agree that the replacement of water and salt to overcome dehydration and demineralization, and the addition of glucose to overcome ketosis may prove life-saving measures.

The tumors in the colon are included only to emphasize the importance of the colon as a water-absorbing organ. From 7 to 10 liters of fluid are poured into the intestinal tract by the various digestive secretions. It is the duty of the colon to retrieve all but from 200 to 300 c cm lost in the feces. When the chyme enters the cecum it is in a fluid state. A tumor on the right side of the colon (Fig 4e) may encroach upon the lumen almost to complete occlusion and yet give no sign of obstruction since the fluid chyme flows easily past the obstruction. One rarely sees acute intestinal obstruction with tumors on the cecal side. In the sigmoid and rectum (Fig 4f) even minimal occlusions of the lumen encounter the solid fecal content, obstruction and bleeding are early symptoms, and a tumor on the right side may produce all the general signs of advanced malignancy before producing any local signs of its presence.

Loss of fluid due to metabolic derangements. A good example of water loss as a result of disease is seen in diabetes mellitus. Admittedly a derangement in the carbohydrate metabolism, water loss in glycosuria, in ketosis, and in impending coma becomes a major factor in morbidity. The diabetic patient in ketosis loses

water because of two unrelated factors. The ketone acids require neutralization by a base to be excreted as salts. With the excretion of this base goes a fixed amount of body water. The second cause is associated with glycosuria. The reason for this loss is not completely understood. The theory that a highly glucose-laden glomerular filtrate exerts sufficient osmotic tension in the lumen of the tubule to prevent water reabsorption is not tenable. If the glomerular filtrate has the same concentration as the plasma, then the glucose content on the vascular side of the tubule is exactly the same as on the lumen side, and leaves no osmotic advantage, so far as the effect of the glucose is concerned, on the lumen side of the tubule. However, though our understanding of the mechanism is not yet clear, the fact is quite clear that dehydration plays an important rôle in diabetic ketosis. This must be borne in mind particularly when surgery is contemplated, and along with the administration of glucose and insulin required to prepare a diabetic patient for surgery, dehydration must be overcome by the adequate administration of water and salt. We (65, 72) have demonstrated the importance of adequate rehydration in a group of 474 surgical diabetic patients. The pre-operative and postoperative regime is based entirely on the urine findings according to the guide shown in Table I.

The rôle played by water and salt loss in massive burns has been generally recognized. The coincidental loss of proteins is often overlooked. The forms of treatment that aim at skin tanning serve their purpose by the prevention of the continued loss of fluid from otherwise open, weeping ulcers. Fantus (21) points out the importance of water and salt replacement, as well as transfusions to replace protein loss.

Long continued massive purulent drainage may prove a factor in the critical loss of protein. The so-called nutritional edemas seen in such cases may in great part be due as much to the protein loss as to the inadequate intake of protein in the diet. Here, too, transfusion is indicated, together with a high protein diet.

TABLE I — PRE-OPERATIVE AND POSTOPERATIVE GUIDE FOR THE SURGICAL DIABETIC PATIENT BASED ON URINALYSIS

Urinalysis	No Sugar	Sugar	Sugar and Acetone
Carbohydrate	50 gm	50 gm	50 gm.
Fluid (85 per cent sodium chloride)	1,000 c cm	1,000 c cm	1,000 c cm
Insulin units	10-15	20-30	30-40

When the deprivation of water and chlorides is not marked the normal compensatory mechanisms to be discussed below, may succeed in restoring the original status when the loss is great, treatment must be instituted to restore the water and salt balance. (It is analogous to the results of hemorrhage. Up to a certain critical loss compensatory mechanisms such as an increased heart rate, constriction of the peripheral vessels or shunting of the blood to vital organs may suffice to maintain the required blood pressure. Beyond this point transfusion becomes indispensable. So in the matter of salt and water loss.)

Dehydration with acidosis. Figure 4b indicates the derangement due to a duodenal fistula with loss of highly alkaline pancreatic juice. The classical experiments have been made by Hartman and Elman (34) and Gamble (28, 25) canalization of the pancreatic duct with complete removal of the external pancreatic secretion was performed. The loss is mainly base bicarbonate and a preponderance of acid radicals is left. The plasma changes were uniformly characteristic with a persistent base bicarbonate and water loss. The plasma volume as compared to cell volume decreased enormously, sometimes being only one fourth of the total blood volume instead of the normal one half. Completely depancreatized dogs live for years under proper diabetic control with insulin. The death of these dogs cannot, therefore, be attributed to the absence of pancreatic juice but rather to its elaboration and loss with the resultant dehydration and acidosis.

The loss of bile even with a complete biliary fistula, is usually well borne. Bile though a well buffered secretion is only mildly alkaline in reaction and its loss entails no appreciable disturbance in the acid base balance or water loss. It contains no digestive enzymes yet its importance in fat digestion is seen in the clay-colored stools when bile is excluded from the intestinal tract. Some 90 per cent of fat fails to be digested and is excreted as such. Added to this there is an excretion of fat into the intestinal tract by the blood stream (as recently shown by Shapiro and his co-workers (70)). Ivy's (42) work indicates the importance of the loss of fat. Vitamins A and D in the production of the hemorrhagic tendencies in jaundice and suggests the administration of the vitamins to overcome such tendencies.

Dehydration in neutrality. Figure 4a demonstrates a lesion near the ileocecal junction associated with a low ileal fistula. The loss is water and neutral salt. The acid base balance is main-

tained as a rule. Dehydration and neutral demineralization are the important factors in this lesion.

Acute intestinal obstruction involving the small intestines below the pylorus (Fig. 4c) produces derangements in the water and salt balance that vary and depend upon the site of obstruction. The lower in the alimentary tract the obstruction occurs the less specific is the tendency toward reduction of chloride or the rise of carbon dioxide because of the fact that the fluid contains a relatively larger admixture of alkaline intestinal secretions.

A frequently overestimated source of comfort to the physician is the absence of vomiting in intestinal obstruction. Gamble (30, 31) has shown that the fluids contained in the distended and non absorbing intestinal tract even in the absence of vomiting will account for the blood changes found in such instances. The mere absence of vomiting is no insurance against marked dehydration and acid base derangements. The fluid that is contained in the intestinal tract from overdistention in paralytic ileus cannot be absorbed and must be considered for all practical purposes as being outside of the body.

The cause of death in intestinal obstruction has been variously ascribed to a variety of factors. Sweet (74) ascribes it to adrenal cortical failure as he believes that the loss of water, the loss of sodium chloride, the blood concentration and the increase in non protein nitrogen are all secondary manifestations. Scudder (67, 68, 69) believes that death is due to the rise in potassium which he has demonstrated in intestinal obstruction. He attributes the potassium rise to a combination of dehydration, tissue breakdown, and the action of bacterial toxin with consequent adrenocortical and renal dysfunction resulting in inadequate potassium elimination. He demonstrates adrenal pathology in cases of acute intestinal obstruction. Atchley (3) believes the dehydration, demineralization and dehydration shock amply explain the mortality in this disease. Gatch (33) reviews many of the causes suggested. They include a toxin elaborated by a perverted secretion of the intestinal epithelium, the effect of the pancreatic enzyme on the proteins present in the duodenum and the production of histamine and allied proteolytic products by the action of putrefactive bacteria in the involved segment.

In a disease such as acute intestinal obstruction there is so wide a variety of derangement that it is extremely hazardous to pick out one

and attribute to it the lethal effects. Infection, toxemia, starvation, ketosis, dehydration, demineralization, hyperpotassemia, azotemia, and alterations in the acid-base balance, as well as the uncertainties of anesthesia, and the dangers of a major surgical procedure come up for consideration. It would be more reasonable to assume that each adds its quota to the morbidity, or to the final mortality, rather than to pick out one of the many and say, "there is the culprit responsible for death."

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WATER AS A DEHYDRATING AGENT

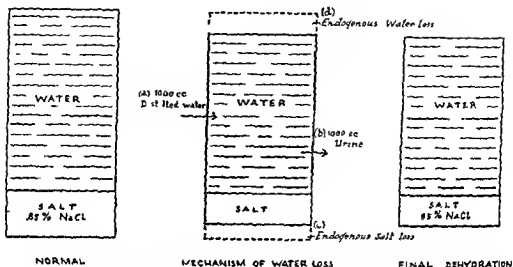


Fig. 5. Illustrating the normal water salt ratio at the left. The mechanism of water loss shows (a) the ingestion of 1,000 c.c. of distilled water (b) its excretion as urine (c) the endogenous salt washed out in urine and (d) the equivalent water loss to restore the normal water salt ratio. At right, the loss of body water as the final result.

PRINCIPLES INVOLVED IN REPLACEMENT THERAPY

The clinical derangements in water and salt metabolism have been mentioned. When do the intrinsic compensatory mechanisms fail to restore equilibrium, and what are the therapeutic methods at our disposal to aid in such restoration?

Before discussing the abnormalities it would be clearer to summarize briefly the normal way in which the body handles water. Figure 5 represents a body in salt water equilibrium. In this state a normal human kidney puts out from 60 to 70 c.c. of urine a minute. If a normal subject were to ingest 1,000 c.c. of distilled water or tap water the urine flow would rise promptly to from 300 to 500 c.c. an hour and within four hours the excretion would include 1,000 c.c. over and above the normal excretion for that time. Theoretically it would appear that the subject should again be in his original state of water salt balance. Actually he is not. He drank distilled water and excreted urine. No matter how dilute that urine may have been the diuresis carried with it, 'washed out,' a certain amount of sodium chloride. In order to restore his original salt water ratio either the salt must be replaced or the body loses an amount of water the equivalent

of the salt loss. It will thus dehydrate itself in order to keep its water salt ratio constant. Peters (58) points out that the ultimate result of such water diuresis is the sweeping out of endogenous salt and interstitial water. The subject loses weight at the expense of extracellular fluid. We are thus faced with the apparent paradox that the more water one drinks the more dehydrated he becomes. However when this is carried to its ultimate absurdity it is found to be all too true. The most dramatic example of the effect of ingestion of large volumes of water is seen in excessive sweating in laborers in hot environments. They may ingest from 8 to 10 liters of water a day; it is excreted as sweat which carries salt with it; as a result a certain amount of endogenous water is lost with each liter of water ingested. These subjects have been known to suffer from peripheral circulatory collapse associated with true dehydration shock.

Another result of the massive administration of distilled or tap water is the production of water intoxication. This occurs when for some reason at present unknown water is not excreted by sweat or kidney. It is postulated that this may be due to a hypersecretion of posterior pituitary

which causes a marked reabsorption of water by the tubules and thus prevents the excretion of water. Helwig (37, 38) reports 2 cases of twitchings, hyper-reflexia, convulsions, and unconsciousness following the administration of large doses of tap water by proctoclysis. The first case showed the typical post-mortem findings of water intoxication. The second, recognized in time, was treated vigorously by intravenous administration of hypertonic saline solution with recovery.

It can be shown that the administration of concentrated saline solution induces dehydration by the elimination of the endogenous water required to dilute it for kidney excretion. Thus both distilled water and concentrated saline solution may be considered dehydrating agents.

Isotonic saline solution, even when given in large quantities, induces a less prompt and less forceful diuretic response. A certain amount of the salt and water are retained and the body weight rises. If dehydration has existed before its administration, it will restore the depleted stores, if it is not needed it will ultimately be excreted without taking with it either endogenous salt or water. Figure 6 shows the comparative diuretic response to water and to saline solution.

From the foregoing it becomes clear that the body cannot retain water without salt, and when dehydration from any of the clinical diseases mentioned above exists, water replacement must be built on a structural scaffolding of salt. The question often is asked whether 5 per cent glucose solution, which too is isotonic with blood, can be used in place of salt. The answer is obviously "No." Glucose is disposed of by being burned to carbon dioxide and water, polymerized to glycogen, or reduced to fat, and distilled water is left behind, and distilled water, as pointed out above, is a dehydrating agent.

It would appear therefore that in the presence of dehydration without alterations in the acid-base balance, one need only administer physiological saline or its equivalent, and since in most instances starvation ketosis is also present, glucose should be added to combat it.

In the case of dehydration associated with acidosis and alkalosis, it would appear imperative that a neutralizing salt be administered, for alkalosis an acidifying salt, such as ammonium chloride, or calcium chloride, and for acidosis an alkalinizing salt, such as sodium bicarbonate or sodium lactate. This is unnecessary in most instances. The same saline solution and glucose used for neutral dehydration is adequate in most cases of acid-base derangement. Such a uni-

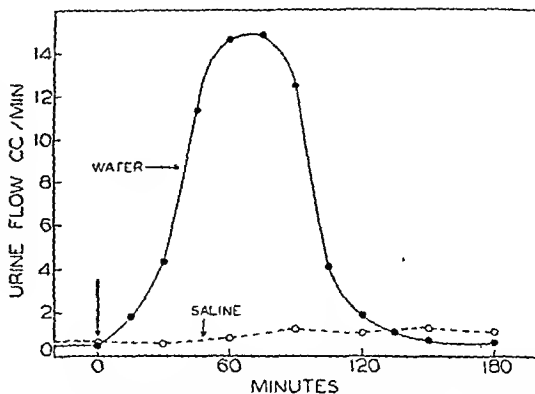


Fig 6 The response of the kidneys in man to 1,000 c cm of water or, alternately, 1,000 c cm of 1 per cent sodium chloride solution ingested at zero minutes. In this experiment 92 per cent of the water was recovered within 180 minutes (Experiment by J A S) From Smith (41)

formity of therapeutic method appears at first sight an extremely unscientific one, a sort of "shot gun," empiric prescription for all contingencies. Shot gun it is, empiric it is not. It is based on an intimate knowledge of the functional elasticity of the kidney, which shares with other organs what Cannon has described as, "the wisdom of the human body."

It has long been known that the kidney can select for retention or excretion those substances needed or not needed by the body, provided, (and it is an extremely important provision) there is a sufficient amount of water available for adequate urinary volume. Given an adequate supply of both basic and acidic ions to work with, and a sufficient amount of water in which to excrete them, the normal kidney demonstrates a most delicately geared mechanism. In alkalosis it will excrete fixed base in large quantities, with bicarbonate, will retain chlorides and ammonium, and most of the nitrogen will be excreted as urea. In acidosis the finished urine contains practically no fixed base, ammonium is excreted to spare base, and little urea and large quantities of chlorides are excreted.

With such a mechanism to depend upon, extrinsic replacement need only supply:

1. Water for pre-existing dehydration, and an excess of water over salt, i.e., a hypotonic solution to ensure adequate diuresis.

2. Salt to replace salt losses and to permit retention of water, no metabolizable substances can replace salt in this capacity.

3. Glucose to combat the ketosis which is so frequently present.

4 Blood by transfusion when protein loss has been marked or for hemorrhage

DETAILS IN INDICATIONS, MATERIALS METHODS AND MECHANICS IN REPLACEMENT THERAPY

Indications When does replacement therapy become an important element in treatment? What evidence is there that fluid and salt, or protein, loss has become a significant factor in the patient's morbidity, or a critical factor in an impending mortality?

Clinically, all physicians of experience can recognize the dry tongue, the lusterless teeth the shrunken lips the sunken eyeballs, the loss of skin elasticity, and the cry of thirst as evidence of marked dehydration. These are, however, advanced signs. Effective therapy must be instituted earlier. At present we have no method available for the measurement of the total body water. On the assumption that changes of body water are reflected more or less equally in all three reservoirs i.e., the blood the extracellular fluid, and the intracellular fluid examination of the blood may be used as a measuring rod for the other two.

The total blood volume can be measured with a fair degree of accuracy by the vital red method or the carbon monoxide method. Each is however a long procedure which limits its value in practical application.

The red blood count and hemoglobin can be determined quickly and except in pre-existing anemias or polycythemias, gives a fair index of the state of dehydration as shown by a rise in the total cell count and hemoglobin. In fluid loss due to hemorrhage there is a fall.

The hematocrit determination measures the relative volumes of plasma and cells in the whole blood. Normally the cells make up something less than 50 per cent of the total blood. Variations in the cell count would give hematocrit readings that could be falsely interpreted. In acidosis the cells imbibe water at the expense of the plasma. Alkalosis has the opposite effect. In acidosis the hematocrit reading would be high in alkalosis low with no actual total change in the body water.

The normal plasma protein concentration values range between a low of 6.3 gm per cent in women and a high of 8.5 in men the average being about 7 gm per cent. Increases in the plasma protein concentration occur with loss of water from the plasma. In Gamble's experiments (25) with fistulas of the pancreatic duct the plasma protein concentration remained practically unchanged for about ten days during

which time there was a reduction of the body weight of over 20 per cent mainly due to water. Evidently this is not an early sign of dehydration. Further, the technique and time required for the determination make it impractical for clinical use.

The normal plasma chloride content is 350 mgm per cent. With depletions following vomiting there is a fall in the chlorides. Such falls may be considered critical when they reach below 250 mgm per cent. The chloride content of cells is half that of plasma. In hemorrhage chlorides may be high for that reason.

There is a wide normal range in the potassium concentration. In cells the concentration ranges between 350 and 465 mgm per cent, in plasma from 18 to 21 mgm per cent. Note that the cell value is almost 20 times the plasma value. The interpretation of figures in dehydration states would be greatly affected by the increase in the red cells per unit volume without a real increase in potassium. Scudder (67, 68, 69) has collected an excellent group of figures on potassium values in intestinal obstruction.

In acidosis and alkalosis due to bicarbonate loss or excess the measurement of the carbon dioxide-combining power is of distinct value. The normal figure is 60 c.c.m. per cent. The most marked falls occur in diabetic acidosis in which values of 20 c.c.m. per cent or less have been reported.

A recent modification of the hanging drop method of determining the blood specific gravity makes this procedure available in the ward. Its value in indicating the plasma water loss is still to be proved. The normal variations in serum protein mentioned above may be greater than the organic changes involved in the subject under investigation. Since the specific gravity depends almost entirely upon the protein values, their wide range introduces an appreciable error in its use.

A simple test for urinary chloride excretion is suggested by Fantus (20). The technique is simple and roughly quantitative. The procedure is as follows:

Ten drops of urine are placed in a test tube, and 1 drop of a 1 to 5 potassium chromate solution is added which causes the solution to take on a definitely yellow color. Then drop by drop (with the same dropper or one of equal caliber) a 2.9 per cent solution of silver nitrate is added until a distinctly red brown color appears. The number of drops required expresses in grams per liter the chloride content of the urine.

This test on each twenty four hour urine specimen will give an early indication of salt retention.

FLUID INTAKE AND OUTPUT CHART

Name		Ward				Date Adm							
Date													
INTAKE	Mouth												
	Rectum retained												
	Transfusion												
	Infusion												
	Clysis												
Total (Blue)													
OUTPUT	Urine												
	Vomitus												
	Fistula, diarrhea												
	Total (Red)												
Urine Sp Grav													
Grams Glucose retained													
Grams Salt retained													
		In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
6,000 c cm													
5,000 c cm													
4,000 c cm													
3,000 c cm													
2,000 c cm													
1,000 c cm													
Remarks													
Chill, pyrexia													
Thirst													
Edema													

when compared to salt administration. This may be included on the intake and output sheet (Chart 1).

It has been pointed out that the urine closely reflects quantitative changes in the water-salt ratio as well as alterations in the acid-base balance. The urine volume falls markedly in dehydration. With this in mind, simple urine volume determinations with specific gravity offer a delicate measure of the importance of dehydration. Except in cases of acute nephritis, or late arteriosclerosis in the aged, a urine flow between 600 and 1,000 c cm with a specific gravity of 1.030 may be accepted as an indication that dehydration is not a major contributing factor to the patient's morbidity. Urine flows below 600 c cm in the absence of kidney damage must be interpreted as functional kidney failure due to an insufficient amount of water made available to the kidney for adequate urinary volume. Under such circumstances water replacement should be considered imperative, both to replace fluid loss and to induce diuresis to promote adequate excretion. This is by far the simplest method available for the determination of dehydration. It has been in use on our Third (New York University) Surgical Service at Bellevue Hos-

pital, and has been found adequate. Blood studies are useful particularly in protein losses and give a more detailed picture of the altered chemical anatomy. They are complex, require some time for completion, and are not indispensable in the actual treatment of the patient.

Materials.

Blood administered by transfusion. For hemorrhage this is specific and curative. For shock with peripheral circulatory failure, transfusion is one of the best forms of therapy. However, it is not curative. The paralyzed capillaries in shock are no respecter of bloods, and they will throw out the donor's plasma, as they have the host's, with equal impartiality. When loss of protein accompanies dehydration, as in massive purulent wounds, in massive burns, or following prolonged diuresis with washing out of native proteins, blood transfusion is the ideal treatment.

Methods to make blood for transfusions more readily available have led to its preservation at low temperatures. Blood so gathered has been used three weeks after its withdrawal with no untoward effect. Lundy (47) stated that, for purposes of economy, blood from a donor's relative which is the improper type for the patient, may be taken and stored for future use. A com-

patible blood may be used from that already stored, or a suitable donor procured for the patient without his having to pay for it, the relative's blood being taken in exchange. Yudin (78) reports the use of blood obtained from cadavers after sudden death. Blood drawn within six or eight hours after death, citrated, and kept in a refrigerator at $+3^{\circ}\text{C}$ was used from two to three weeks later with no ill effects.

Lymphole serum. Methods for the preservation of normal blood serum in desiccated form have been developed (19, 23, 54). In this dry form all the solid elements are preserved, the proteins appear to be unaltered and their antibody titers remain unchanged. Bond and Wright (9) redissolved it in water and used it in experimental shock and hemorrhage. Their results were inconclusive as reactions occurred and the question of compatible blood types was not worked out. The clinical value of this serum must yet be proved.

Acacia solution. This is usually put up in the form of a 6 per cent solution in normal saline solution. Its advantage over crystalloidal solutions lies in its being a large protein molecule, less likely to diffuse out of the capillary bed into the surrounding tissues. Thus in shock the experimental evidence reveals a more sustained rise in the blood pressure following the intravenous administration of acacia than after the administration of normal saline or Ringer's solution. Acacia at the present time is adequately sterilized, and there is not the old fear of its retaining tetanus spores. Studdiford (73) reports severe and fatal reactions following the intravenous use of gum acacia due to its toxic effect upon the liver. Maytum (40) cautions against the development of sensitivity to acacia manifested at its second use in the same patient within a period of from two to three weeks as intervened. The volume injected varies between 300 and 500 c.c. It is a viscous solution and is best given slowly.

Glucose given as a 5 per cent solution has its ideal indication in the presence of ketosis. It may also be used intravenously in that strength which is isotonic with plasma in order to introduce the effect of distilled water to evoke a diuresis. Distilled water should never be given intravenously. The speed at which glucose is administered should not exceed the rate at which it can be abstracted from the blood stream. Woodyatt, Sansum and Wilder (77) calculated this rate in dogs as being 0.8 gm. per kilo per hour. If this can be translated quantitatively to the human being, a man weighing 70 kgm.

should be able to absorb 56 gm. of glucose in an hour. In other words in 5 per cent strength (50 gm. to the liter) a subject weighing 70 kgm. should be able to receive 1,000 c.c. of solution intravenously in one hour without spilling any into the urine. Clinically this is not found to be true. Often at rates of from 300 to 400 c.c. an hour a glycosuria appears.

Saline solution. Sodium chloride in 85 or 4 per cent solution may be used in cases of neutral demineralization or in acidosis or alkalosis provided there is adequate kidney function. Its use in intestinal obstruction has been repeatedly emphasized (14, 15, 35, 36, 50, 56). In circulatory failure of either central or peripheral origin, in the advanced age group and in the presence of obvious kidney damage the quantity of sodium chloride given must be carefully followed if complications are to be avoided. The 4 per cent solution or even the 2 per cent solution is more advisable in the latter group.

Ringer's solution is to be used for the same indications mentioned for physiological saline. It has the added advantage of supplying the other cations, calcium and potassium, in the concentrations found in normal plasma.

Hartman's solution is a slightly diluted Ringer's solution plus sodium lactate. The dilution makes it hypotonic to plasma and so evokes a swifter diuresis. The sodium lactate is an alkalizing salt and one that combats ketosis. The lactate is burned to carbon dioxide and water as any carbohydrate which leaves basic sodium in excess. In severe acidosis or in the aged the addition of the alkalizing salt offers an immediate base for neutralization.

Water, either distilled or tap water, has a real and important place in this group of derangements. Its most important function is the supply of the medium in which the kidney can perform its function as the controlling mechanism in the maintenance of the acid base balance. For this purpose it is irreplaceable. It may also be used to release edema due to salt retention. However, it should not be used to replace lost tissue or plasma fluids since the body normally cannot retain water without salt. Distilled water as such, should not be given intravenously since it may take the red cells in contact with it. As discussed under glucose, it may be given with 5 per cent glucose. The glucose is metabolized and leaves distilled water behind.

Concentrated glucose or sucrose (50 per cent solution). The use of concentrated solutions for purposes of dehydration in acute cerebral trauma had its origin in 1919. Weed and McKibbin (76)

demonstrated reductions in the intracranial pressure following the intravenous and ingested introduction of hypertonic saline solution. Fay (22) has summed up the advantages of 50 per cent glucose or sucrose over saline solution. States of water retention manifested in areas other than the cranial cavity are equally amenable to dehydration therapy. The physiological mechanism consists of the withdrawal of extracellular fluid into the vascular bed by the increased osmotic tension exerted by the concentrated solution. This is carried to the kidney and there excreted. Sucrose is the preferable solution since it is a non-metabolizable sugar when injected intravenously and is quantitatively excreted by the kidney. Fifty cubic centimeters of a 50 per cent solution may be used to release pulmonary or diffuse edema, this amount may be repeated in three or four hours, if necessary.

Saline solution 5 to 10 per cent. Concentrated saline solution finds its greatest usefulness in water intoxication, i.e., the retention of water without salt, probably due to a derangement in the tubular reabsorption mechanism controlled by the anterior pituitary hormone.

Routes of Administration

Mouth. It is well to bear in mind that the intestinal tract is still the best equipped organ for the absorption of ingested material. In cases of massive burns, in shock not associated with gastro-intestinal derangement, or in diabetic ketosis not associated with vomiting, fluids can be administered by mouth. A simple method that assures fluid and salt intake is to insert a duodenal tube connected to a reservoir which feeds a constant drip into the stomach. The advantage of the oral method is obvious since proteins and medications may be added to the fluid. There is the added advantage of normal absorption and the unlikelihood of complications due to the administration of excess fluid.

Rectum. Water, salt, and glucose are absorbed by this organ. In dehydration, absorption by rectum is markedly increased, and considerable quantities of fluid can be administered by rectal taps. As much as 300 c.c. may be given every two hours in such states with complete absorption before the next instillation. Glucose should be given in 1 per cent solution. Stronger solutions (5%) soon irritate the mucosa and produce an inflammation which bars further absorption. The glucose may be dissolved in normal saline solution.

Subcutaneous hypodermoclysis. Within the past five years this method of fluid replacement has been almost entirely discarded by the Third (New York University) Division of Bellevue

Hospital. It is a painful method, the quantity of fluid that may be given is limited, its absorption in states of circulatory collapse is uncertain, and we have had several massive sloughs following the use of glucose in saline solution. In infants this method is still in use, the amounts being smaller and the intravenous route often offering technical difficulties not encountered in the adult.

Intravenous infusion. This is being used exclusively in our wards at the present time. It has none of the disadvantages of the hypodermoclysis, and the older complications following its use have been almost entirely eliminated. The proper preparation of the infusion fluids, the adequate care of the dispensers, needles, and rubber tubing have almost completely eliminated the frequent chill and pyrexia following its use.

Mechanics. There are, at present, many types of dispenser in use for infusion. The older types consist of a compact metal box containing the entire apparatus which can be sterilized as a single unit. The fluid to be used is poured into the graduated cylinder which is part of this unit. The newer methods utilize the fluid container as the dispensing vial thus eliminating one source of contamination and reducing the sterilizing unit to the tubing and needles with no breakable glassware requiring sterilization. The older and some of the newer dispensers are shown in Figure 7.

The source of the "pyrogenic" substance in infusion fluids has been demonstrated by CoTui and his co-workers (16, 17) as being of a particulate nature of a larger order of magnitude than 50 millimicrons. This can be effectively removed from infusion fluid by passing the final fluid mixture through compressed asbestos filters of the Seitz serum No. 3 type. Our present process of preparing fluids for intravenous use is that outlined by the above author. It consists of distillation, the addition of chemicals, absorption filtration, and finally, sterilization. The container is used as the dispenser. With this method of preparation we have practically eliminated so-called infusion reactions.

For smaller hospitals the purchase of prepared infusion materials from supply houses will be found more convenient and less expensive than the establishment of a sterilizing plant.

Some details of administration may be worth repeating. We make little attempt to keep the flask warm after it has once been raised to the proper temperature and connected. A simple method of taking the chill out of the fluid consists in running the tubing along the wrist and forearm to the cubital vein and bandaging it next to the skin. The body temperature, plus the original

warmth of the solution is usually sufficient. The effect of cooling by infusion fluid must be minimal since it meets so much larger a blood volume.

The speed of infusion rarely exceeds 300 c cm an hour. When this amount is added to a circulation of from 5 000 to 6 000 c cm a minute, the cooling effect can be seen to be minimal. Rates of 500 c cm an hour are not unusual and we have seen no untoward effects from them. A Murphy drip delivering from 70 to 80 drops a minute is adequate. This can be checked by one's own pulse rate.

The amount of infusion is an important item. The late Stewart, when asked how large an abdominal incision should be made, answered "Large enough." The same may be said of infusion fluids, enough should be given. Yet we have no direct measurement of body fluid; we have no definite knowledge of how much fluid and mineral matter has been lost before admission. We have only the general appearance of the patient and the laboratory data mentioned above, which is not always too exact or too reliable. Coller and Maddock (14) have made a lasting contribution of sound practical significance in the determination of the quantitative needs of a dehydrated patient. The authors have shown that 3 500 c cm of fluid are needed daily, 2 000 for water of vaporization and 1,500 c cm for urine. This is a generous estimate and may be reduced. If there is loss by vomiting or by a fistula of the intestine the amount lost should be added to the 3 500 c cm. For patients who come in marked dehydration they advise the maintenance requirement of 3 500 c cm plus water the equivalent of 0 per cent of their body weight. Thus a patient weighing 60 kgm would require 3 500 plus 3 600 a total of 7 100 c cm (Table II).

One point should be stressed in undertaking the replacement of this fluid loss. That is that one should not attempt to achieve this replacement within a matter of hours. Like the aged diabetic in coma or impending coma who must be brought out of it slowly if one is to avoid a catastrophe, these patients in dehydration, particularly the older age group and the group with circulatory failure, whether the condition be of peripheral or central origin, should be rehydrated judiciously. There is no absolute necessity to replace the entire 7 000 c cm at one fell swoop. It is much safer to re-establish good urine flow by the use of hypotonic solution, i.e. glucose in a per cent saline solution, even though that would mean a somewhat smaller water retention for the first twenty-four hours, and then continue parenteral fluid for a longer period of time in smaller amounts.

COMPLICATIONS

Chill and pyrexia, which have been mentioned.

Salt edema. This is to be expected in the aged with arterio-sclerotic kidneys whose last stand under usual circumstances is their ability to put out a large volume of urine of low specific gravity. Faced with the necessity of putting out some extra 30 or 40 gm of salt a day, they fail the salt is retained, and just as surely as the body cannot retain water without salt, just so surely can it retain water with salt. Water is retained until edema becomes plainly manifest.

Edema from hypoproteinemia. When the original disease has been a prolonged and debilitating one, protein has been lost during its course. Massive infusions, now administered, wash out proteins until the diminution becomes critical. Normally, fluid is retained in the vascular system by the osmotic tension exerted by the plasma proteins against the intravascular hydrostatic pressure. With the fall in plasma proteins and no change in hydrostatic pressure, fluid is forced out into the tissues and edema develops rapidly. Kerkhof (45, 46) has demonstrated the necessity of both salt excess and hypoproteinemia in the production of edema.

Another source of edema arises in the increase of capillary permeability due to prolonged anoxia, which is a not infrequent accompaniment of the shock syndrome.

The location of the edema is of extreme importance. Dependent edema in the extremities is well borne and should be taken as a distinct warning signal. When edema distributes itself in the lungs, pulmonary edema becomes a critical factor in mortality. Moon's (51, 52) work on the production of pulmonary edema by the introduction of agents that injure capillary endothelium suggests strongly the possibility of what may be termed 'local' shock in isolated capillary beds. In the lungs this may be a fatal complication.

Methods of Releasing Edema. Once established, the edema can be released if the underlying cause for its production is understood. The methods would include:

1. The intravenous administration of 5 per cent glucose in distilled water. From the earlier discussion of water as a dehydrating agent, we may expect that distilled water will wash out salt and so release the water held by it. We have seen a massive edema extending to the chest wall completely released in forty-eight hours by the administration of 6 000 c cm of 5 per cent glucose in distilled water over that period.

2. The administration of concentrated glucose or sucrose solutions. Fifty cubic centimeters of

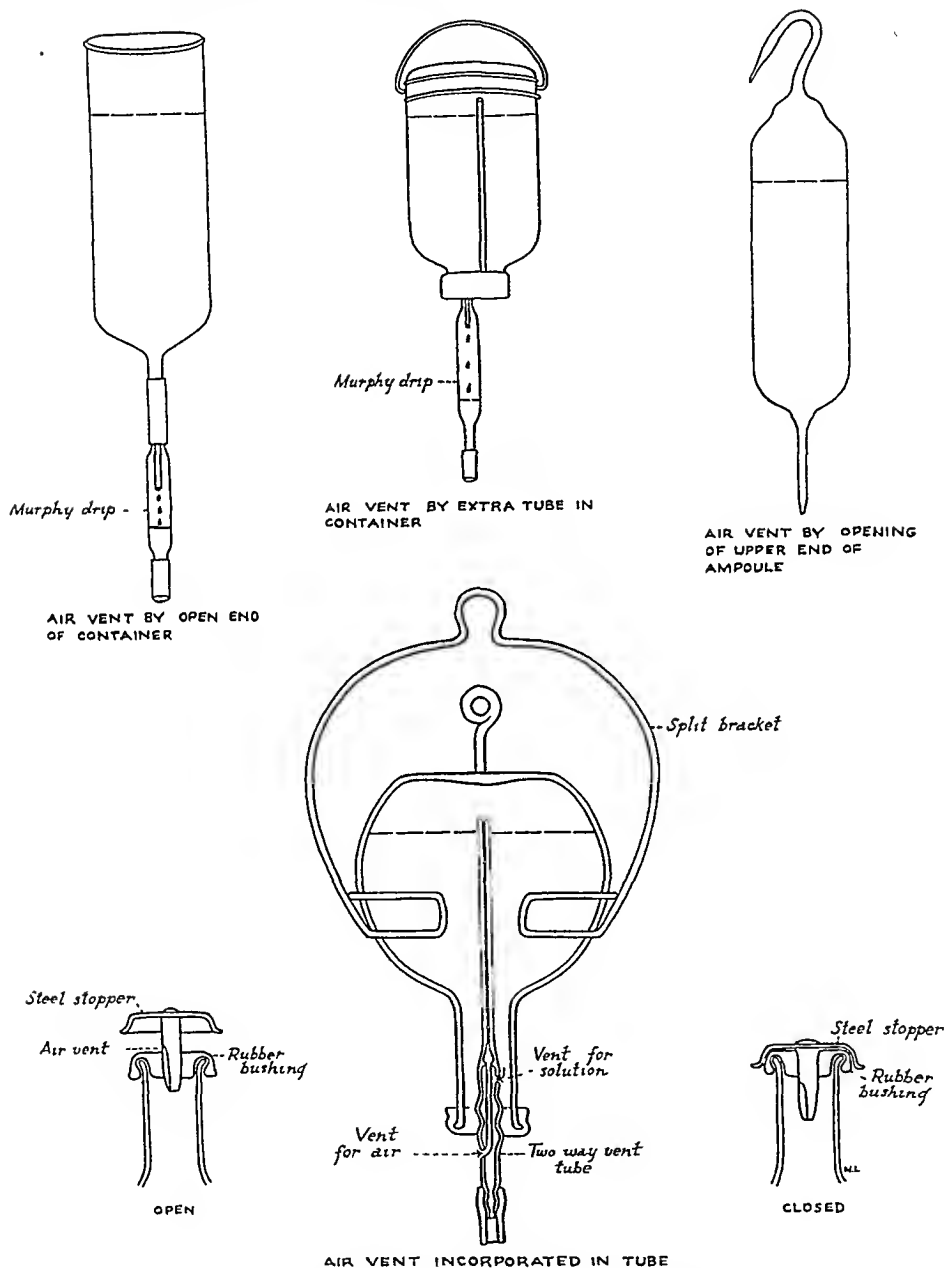


Fig 7 Illustrating various containers for infusion apparatus. Upper left figure must have fluid poured into it from a sterilizing flask. In the other three the sterilizing flask is also the dispensing vial. All vials are calibrated.

TABLE II—SOLUTIONS SUITABLE FOR PARENTERAL USE

Solution	Indications	Amount in 24 h. up to 60 kilo max
1 Sodium chloride 85 per cent	Dehydration acidosis alkalosis shock	3 500 c cm plus loss by vomiting or fistula
2 Sodium chloride 4 per cent	As above and for oliguria	As above
3 Ringer's	As for 85 per cent saline	As above
4 Hartman's	As above and in severe acidosis and in the aged	As above
5 5 per cent glucose in distilled water	Oliguria, salt edema ketosis	2 000 to 3 000 c cm
6 5 per cent glucose in 85 per cent saline	Dehydration acidosis alkalosis ketosis shock	As for 85 per cent saline
7 5 per cent glucose in 4 per cent saline	Dehydration, acidosis alkalosis oliguria	As for 85 per cent saline
8 Sodium chloride 5-10 per cent	Water intoxication	1 000-2 000 c cm
9 50 per cent glucose or sucrose	In water retention salt edema pulmonary edema increased intracranial tension	50-100 c cm Repeat in 4 hours.
10 Blood transfusion	Hemorrhage shock edema from protein loss	500-750 c cm
11 Acacia 6 per cent in saline	As for blood transfusion	300-400 c cm

Note: Of the crystalline solutions 6 and 7 are the most useful. The hypotonicity of 7 c more the advantage of a swift diuresis. By hypotonicity is meant the ultrafiltrate of plasma relative to body water. As administered all the above are either isotonic or hypotonic. All the above may be given intravenously. A 7% solution may be given subcutaneously.

50 per cent glucose or sucrose solution may be injected intravenously. These agents act as dehydrating agents as when they are used for reducing increased intracranial tension or pulmonary edema. The withdrawal of fluid into the vascular bed to be excreted by the kidneys is due to the hypertonicity of the injected fluid. Diuresis is prompt but of short duration and requires repetition of the procedure. Sucrose is more effective than glucose and its effect lasts longer.

3. Blood transfusion. This is the ideal method for the replacement of proteins as well as for overcoming anoxia and its consequent capillary functional damage.

4. The administration of acacia. Experimentally Kerkhof has proved the value of acacia in increasing the colloid osmotic tension sufficiently to withdraw fluid from the tissues for urinary excretion. He has demonstrated that edema does not occur in dogs following plasmapheresis if acacia is injected in strengths ranging from 6 to 30 per cent.

CONCLUSIONS

The recognition of states of dehydration and derangements in the acid base balance opened a

new field of therapy. Parenteral fluid and salt replacement added to the specific medical or surgical procedure has reduced morbidity and in some instances shown dramatic reduction in the mortality. It is a valuable addition to our therapeutic armamentarium. Like other methods it must be used intelligently.

The administration of intravenous fluid can be overdone. Too many liters of fluid are often poured into defenseless veins to do irreparable damage to defenseless patients. The statement is often heard 'Well give him another infusion it can do no harm.' The indication for therapy is not that it will do no harm; we have a right to demand that it do good.

In the aged in patients with circulatory failure and in patients with known kidney damage, parenteral fluids should be given with the greatest care.

In the normal adult 3 500 c cm plus the amount known to be lost by the gastro-intestinal or other routes may be administered. This should be administered as a 5 per cent glucose solution with saline solution in hypotonic strength, (4 per cent) to evoke a good diuresis.

The duration of the administration of parenteral fluid should be determined by the urine volume output and the specific gravity. When the urine flow is between 600 and 1,000 c cm a day with a specific gravity between 1.020 and 1.030, dehydration may be considered an unimportant contributing factor to the patient's morbidity.

A simple chart of fluid intake and output as illustrated will greatly facilitate the care of the dehydrated patient.

COMMENT

The appearance of an article on water and salt metabolism in a so-called "clinical" journal requires an apology or an explanation, or both. It will find justification before a group of clinical workers only if it succeeds in achieving a simplification in diagnosis or therapy of hitherto existing complexities in medicine and surgery.

Twenty-five years ago such an article could not have appeared because at that time practical methods for the analysis of blood had not yet been introduced to the medical profession. These methods were evolved in the chemical and physiological laboratories and have remained there. However, their interpretation has filtered out of the laboratories to the bedside where it belongs. Clinicians, as individuals, have tried to acquaint themselves with these new instruments placed at their disposal by the preclinical laboratories. Their response has been so eager and, in the main, so co-operative that the preclinician has stopped looking down his spectacles at the clinician as a therapeutic empiricist. A wise old physician in discussing the problem said, "What the doctor needs is a laboratory, what the patient needs is a doctor." Neither is superior, each has his place and his function.

In recent years we find the clinician welcomed to the laboratory as a fertile source of first-hand information gleaned at the bedside. With him have come such problems in clinical medicine and surgery as can be solved by the combined efforts of the trained laboratory worker and the trained bedside or operating-room clinician. As a further development of this symbiosis there is emerging the newer clinician, the doctor trained in the chemistry or physiology laboratory who can apply that knowledge at the bedside or in the operating room.

Medical school curricula have changed to meet these new advances. There was a time when a student was taught the detailed symptoms of a disease which he then had to label. His excellence as a student was then measured by the number of such labels he could conjure up out of his memory.

Today we stress the underlying physiological derangements responsible for the symptoms seen in the disease. The student thus becomes rich in principles rather than in facts. He learns to bring together under one common denominator various diseases that have no apparent clinical similarity, but which share a common fundamental dislocation. For example, he finds a clinical disease entity in mountain sickness, and a physiological identity in carbon-monoxide poisoning, congestive heart failure, or pernicious anemia in that each is an example of oxygen lack. He learns to consider such a group under the unified heading of anoxia.

Similarly he learns to group together a number of clinically unrelated diseases in each of which water derangement plays a significant or critical rôle. Clinically there is no apparent similarity between a patient suffering from a ruptured ectopic pregnancy and one with acute intestinal obstruction, or a patient in diabetic coma. Yet in each there has been a loss of body fluid, the replacement of which may prove the determining factor in recovery.

With such an understanding of disease, the complexity of unrelated details takes on a unified simplicity, and makes for a more reasonable understanding of symptomatology and for a more rational form of therapy.

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RECENT GLAUCOMA OPERATIONS, WITH SPECIAL REFERENCE TO METHODS AND INDICATIONS

Collective Review

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THE past year has disclosed some modifications of older procedures in an attempt to improve the ultimate end-results or length of duration of "cures," especially in the treatment of compensated glaucoma (glaucoma simplex). It is not altogether clear as to why certain eyes retain a normal tension after surgical interference, and other eyes require multiple surgical procedures to control the tension. This is probably due to the fact that the present surgical treatment is symptomatic, as the underlying etiology is still a questionable factor.

Barkan (3) published accounts of a new operation in which he refers to his investigations of the cause of glaucoma and states that in over half of the cases of non-congestive primary glaucoma, obstruction of the outflow of aqueous from the anterior chamber into Schlemm's canal causes the condition. This obstruction is located in the sclerocorneal trabeculum. He states that these conclusions are confirmed by the incision of the trabeculum and the opening of Schlemm's canal, which restores the normal tension. This is the basis of his goniotomy operation, which consists of the opening of Schlemm's canal by means of a knife introduced at the temporal limbus and carried across the anterior chamber until its blade disappears behind the nasal limbus. He now uses a specially constructed contact glass and a head loupe, which enables him to follow the knife while it pierces the trabeculum and opens Schlemm's canal. His conclusions and summary are as follows:

"It is suggested that this operation, which restores the physiological function of Schlemm's canal, solves the surgical problem of most cases of chronic primary glaucoma. It is equally successful in certain cases of secondary glaucoma. The results are predictable and appear to be permanent. It involves a new principle in the surgery of glaucoma in that the angle of the anterior chamber and Schlemm's canal are under full view and magnified during the operation. The operation is without danger when the proper technique is used and has proven completely suc-

cessful in the writer's hands when certain pre-operative indications (binocular biomicroscopic diagnosis) have been fulfilled."

Brecher (5) reports upon one case in which he attempts to improve upon the conventional cyclodialysis operation. He states that the chief defect in a simple cyclodialysis is that the ciliary body becomes attached again to the overlying sclera shortly after it is separated surgically, and the tension-regulating communication between anterior chamber and suprachoroidal space disappears. He attempts to prevent this closure by inserting a 5 by 4 mm. piece of egg membrane into the suprachoroidal space after performing a typical cyclodialysis. The membrane is pushed in with a spatula until it reaches the anterior chamber and the posterior edge protrudes slightly from the scleral wound and is covered with the conjunctiva.

Grosz (11) reports the use of glaucosan iontophoresis according to Weve's method with the electrode of von Heuven in a series of 13 cases. The dose is one minute at one sitting, and as a rule 2 treatments are necessary. Usually good results were noted in secondary glaucoma, in aphakic eyes, and in inflammations of the uvea. In other cases of secondary glaucoma, and in primary glaucoma, there was no improvement noted. This method may also be used for diagnostic pupillary dilatation and lowering of the tension preparatory to operation, because this method works better and is less painful than the instillation method and may be repeated daily.

Berens (4) believes he has improved upon the Lagrange iridosclerectomy and the punch operation of Holth. His technique is to inject 1-per-cent novocaine solution with adrenalin over all recti muscles and the upper limbus region and 1 cm. of novocaine solution into the ciliary ganglion. A 15-mm incision through the conjunctiva is made with a Stevens scissors 10 mm. above the limbus and the conjunctiva dissected down to the limbus where the cornea is split further for a distance of 1.5 mm. A curved keratome is inserted 15 mm. above the cornea and a 4 mm. incision made into the anterior chamber. The iris is pre-

vented from prolapsing, if possible. If not it is replaced. The scleral wound is enlarged at both ends with the same scissors for a distance of $\frac{1}{2}$ mm. The corneo-scleral lip is punched out with a punch, so that an irregular saw like wound from 0.5 to 0.7 mm into the cornea is produced. Total iridectomy is performed in congestive glaucoma and peripheral iridectomy in non congestive glaucoma. The iris is replaced by means of irrigation of the anterior chamber with normal saline solution. The conjunctiva is closed with a running suture anchored at both ends. The anterior chamber is again irrigated. Metaphen unguentum (1:2500) and atropine are instilled. The eye is massaged 3 times daily following the first twenty-four hours. There were 73 operations on 68 eyes of 50 patients: normal or sub-normal tension resulted in 86.8 per cent of 38 primary glaucomas; in 73.1 per cent (26 eyes) in secondary glaucoma; and in 75 per cent (4 eyes) in acute glaucoma. The postoperative treatment necessitated 5 paracenteses, 2 enucleations, modified iridotomy and trephines, 2 posterior and 1 anterior sclerectomies. There was 1 expulsion of a small lens in microphthalmos, several ruptures of the conjunctival bleb, and frequent iritis. Berens recommends the operation in all forms of glaucoma such as chronic non-congestive and secondary, and also in glaucoma after lens extraction.

On the theory that the lowering of tension following a cyclodialysis was due to a decrease in the production of aqueous secretion on account of an atrophy of the ciliary body, Vogt (22) attempts to produce the same process by diathermic destruction of the ciliary body. After dissecting the conjunctiva surrounding $\frac{1}{2}$ to $\frac{3}{4}$ of the circumference of the cornea, from 50 to 100 or more $\frac{1}{2}$ to $1\frac{1}{2}$ second diathermy punctures are made from $1\frac{1}{2}$ to $3\frac{1}{2}$ mm from the limbus with a needle 0.2 mm in diameter and 1 mm in length. The area is covered with conjunctiva. The operation may be done in two or more sittings. The current used may vary from 60 to 90 ma. The eye may become quite soft during the procedure. At the time the report was written sufficient time had not elapsed to tell definitely if any harm to the lens may have occurred.

An improvement upon the Seton operation in glaucoma first advocated by Zorab in 1912 was promulgated by Wolfe and Blaess (24). Their method consists of preparing conjunctival pockets in the inner and outer quadrants extending down to the cornea. A 3 mm incision is made into the anterior chamber with a keratome. A white silk thread is then inserted into the anterior chamber with aid of a blunt tear sac needle and so placed

that the free ends extend from 4 to 5 mm into each conjunctival pocket. The conjunctiva is closed with running sutures, which are removed five or six days later. If no fistula is produced, the suture may be manipulated to and fro through the conjunctiva, with a forceps.

Several years ago Sallman advocated the use of a trephine opening in place of a scleral incision with a scalpel or keratome for a typical cyclodialysis. Petrow (19) advises that a similar effect can be obtained when a trephine is not available. He states that the incision with a scalpel should be made through the sclera obliquely toward the cornea instead of vertically. A second incision from 1 to 2 mm nearer the limbus is made with a scalpel, a spatula being kept inserted in the wound to prevent trauma to the deeper tissues. This scleral piece is then excised or the spatula may be removed and the distal portion of the incised piece of sclera seized with a forceps and excised with a scissors. No complications are reported. As a rule, the results were favorable, the tension remaining normal. Eighteen cases were reported upon of which 13 were compensated and 5 absolute glaucomas. Tension before operation was between 33 and 70 mm Hg. afterward between 10 and 30. The longest period of observation was two months.

In an attempt to decrease the difficulty of forcing a spatula into the anterior chamber during a cyclodialysis Archangelsky (1) devised a spatula forceps similar in appearance to a DeWecker scissors curved to fit the curvature of the eyeball. This instrument is inserted into the anterior chamber with the blades closed the same as a cyclodialysis spatula. The blades are separated the instrument withdrawn with the blades partially separated. The advantages are presumed to be an easy entrance into the anterior chamber and absence of lateral eyeball movement during operation.

Postoperative glaucoma is a subject of prime importance to all ophthalmologists. Following a search of American literature as to its etiology, Fox (9) states that the consensus of opinion seems to be that it is due to a plugging up of the anterior chamber angle. He reports on 1629 operations of which 1182 were lens extractions and 447 dissections. There were 14 cases (1.2 per cent) of glaucoma following lens extraction and 10 cases (2.2 per cent) after dissection. The causes for the increased tension were as follows: a thickened secondary capsule in 6 cases, lens matter in the anterior chamber in 4 cases, anterior synechia in 4 cases, capsule remnants in the wound in 3 cases, and glaucoma before operation in 1 case. These

statistics agree with those of Knapp who reported increased tension in 12 per cent of 400 cases of intracapsular lens extraction, and about the same frequency after extracapsular extraction. The increased tension occurred from two days to twenty-two months after the operation, and in 10 cases within one month. Methods of treatment recommended are iridectomy with hooks, basal iridectomy, incision of the incarcerated capsule remnants, trephination and cyclodialysis. The prevention of increased tension is facilitated by keeping the anterior chamber clear after operation. Fox states that the prognosis of postoperative glaucoma is not good.

Wheeler (23) advocates an iridectomy with cyclodialysis in refractory cases of glaucoma in which an iridectomy, trephine, or iris-inclusion operation has not sufficed to lower the tension to normal. The operation was originally recommended by Woottan in 1932 to prevent the formation of synechia and allow drainage through Schlemm's canal. Anesthesia is obtained by the instillation of 2 per cent cocaine, and the administration of novocaine subconjunctivally in the area of operation and by retrobulbar injection. Cyclodialysis is performed in the usual manner in either the upper or lower quadrant, with undermining of the conjunctiva to the limbus. An incision at the limbus is then made with a keratome, followed by a wide iridectomy which should extend to the ciliary body. Wheeler believes this method is indicated in cases in which miotics and conservative methods have failed. Czermak advocated a similar iridectomy thirty years ago.

In 1930 Kronfeld (14) reported a new provocative test to supplement the dark room and homatropine test to aid in the early diagnosis of glaucoma. This consists of complete emptying of the anterior chamber, which is followed in from one to two and one-half hours by a reactive hypertony. The anterior chamber puncture is usually harmless when a short needle is used and inserted flat while the eyeball is held with two fixation forceps by an assistant. In more than 400 cases, only 2 lenses were injured with resultant cataract formation. In a further series of 12 cases of early glaucoma, Kronfeld found that the resultant hypertony was 10 mm Hg, or higher than in a similar number of control cases. The authors advise tension measurements every half hour for three hours, following the emptying of the chamber.

Strachow (21) concludes from his own experiences and an extensive perusal of the literature that the Elliot trephine operation leads to the best end-results as far as lowering the tension

rapidly to normal and keeping it there is concerned. He maintains, however, that it is not entirely safe when a marked constriction of the visual field is present. One must also consider the danger of a late infection through the trephine opening. On the other hand, the cyclodialysis of Heine does not lower the tension as rapidly, but is not so dangerous a procedure when the visual field is quite constricted. He reserves the classical iridectomy of von Graefe only for cases of acute glaucoma, in which the anterior chamber is still deep enough to allow for a good surgical approach.

Heine (12) quotes the statistics from the Universitäts-Augenklinik, Budapest, from 1904 to 1935, recently published by Grosz, which show that the original widely used iridectomy and the later Elliot trephine operations have been greatly supplanted by cyclodialysis during the past ten years. Heine postulates upon the origin and history of cyclodialysis and refers to an early work of Fuchs in 1905, in which the latter stated that the hypotony and choroidal detachment occurring after lens extraction is due to a fistula formation between the anterior chamber and the suprachoroidal space. This theory was later elaborated upon by Elschnig. Heine quotes the work of Vannas published from the German University Eye Clinic at Prague, in which postoperative gonioscopic examinations were made upon 37 cases of glaucoma in which cyclodialysis had been performed. It was found that in all cases in which the tension had been lowered to normal, a communication existed between the anterior chamber and the supraciliary space, in contrast to the cases in which the tension remained high, in which the sclera had again become attached to the ciliary body. In 3 cases in which a second cyclodialysis had been successful, it was found that the ciliary body had become reattached at the area of the first operation but remained free in the region of the second. Heine also quotes Elschnig's anatomical report of an eye upon which a cyclodialysis had been performed and in which he found an open communication between the supraciliary space and the anterior chamber. The cyclodialysis may be repeated several times if previous attempts are not successful in lowering the tension. Heine believes that cyclodialysis is contra-indicated in cases of glaucoma associated with iritis, as the further irritation of the ciliary body results in more adhesions at the chamber angle, for these cases he recommends repeated anterior chamber punctures. Heine does not recommend a combination of cyclodialysis and an Elliot trephination, nor a trephine operation for buphthalmos.

Auerbach (2) describes some very interesting experiences in attempting the prevention of an expulsive hemorrhage. An expulsive hemorrhage is always a disastrous affair and may occur in other than postoperative cases, such as perforating corneal ulcer. It most frequently follows postoperative interference such as a Saemisch puncture for corneal ulcer. In the Helmholtz Eye Clinic in Moscow it occurs once in from every 200 to 300 cataract extractions. It may occur at the time of operation, while the patient is still on the operating table several hours later, or even several days later. If the operative wound is not ruptured, the eye becomes stony hard (malignant glaucoma). The bleeding usually comes from the long ciliary arteries. As the sclera is a rather resistant structure, the blood usually forces out the entire intra-ocular contents except the choroid. Auerbach, in agreement with the recommendation of Von Grosse, Fromaget, Verhoff and Filatow, believes that a preliminary Elliot trephine should be performed in eyes preparatory to lens extraction when an expulsive hemorrhage has occurred in the previous eye. Three cases are reported with successful results.

Filatow (8) reports 8 cases in which he performed a prophylactic sclerotomy for the prevention of an expulsive hemorrhage, in 6 cases preparatory to a glaucoma operation in 1 case before lens extraction from a glaucomatous eye, and in 1 case before cataract extraction in a patient who had lost the other eye following an expulsive hemorrhage. In the last case the choroid was injured and vitreous appeared. The lens extraction was performed under difficulty with a loop because of the softness of the eye. The postoperative recovery was uneventful. The prophylactic sclerotomy has two important factors. First it allows for the drainage of blood from the sub-choroidal hemorrhage. Second it lowers the tension in glaucoma so that the blood vessels are not unnecessarily constricted. In 1 case following sclerotomy the tension dropped from 46 to 26 mm Hg. Sclerotomy is best done in the outer lower quadrant midway between the equator and the ora serrata with a 2 mm trephine just before the major procedure. Protruding choroid usually replaces itself following the major procedure. The fact must also be considered that the hemorrhage may not be external but into the vitreous body.

On the theory that the tension may be lowered by a reduction of the amount of blood allowed to flow into the blood vessels of the choroid, Sapir (20) recommends the tenotomy of the four vertical external muscles. By this procedure the anterior ciliary arteries are severed. In 4 cases the

lowering of the tension was only transitory, but in many of the cases the tension remained normal for months. The results in 20 cases were reported. In several cases exophthalmos and strabismus resulted. To avoid these complications the author ligated the four muscles with ligatures which were left in place at least ten days. In some cases he cauterized the muscle tendons with a thermo-cautery. The same lowering of tension occurred following all these modifications.

Working on the assumption that the simple cyclodialysis often fails to lower the tension, Kadlicky (13) performed iridencleisis according to Del Barro. Because of the short period of observation only the intermediate results can be reported. Twenty five operations were performed, 13 in simple, 10 in chronic uncompensated, and in acute uncompensated glaucoma. The technique is simple, the risk no greater than in cyclodialysis. Once the lens was injured due to the injudicious use of a sharp hook, and once the iris was not pulled out far enough so the sphincter slipped back into the anterior chamber. The tension became normal in 23 cases and in 2 it remained high. In 2 cases the vision became worse because of hemorrhage into the vitreous. In 2 cases with excavated discs and marked contraction of the visual fields, function was lost in spite of the tension remaining normal. Only 6 cases were observed over a long period of time: 2 for nine months, 3 for six months and 1 for five months. The tension always remained normal. The decrease in function of the 2 cases enumerated was not the result of the operation but was probably due to the general physical condition. In comparison to the other procedures, Elliot trephine, cyclodialysis, and iridectomy, the results appear to be better. In view of the fact that the operation is easy to perform and not very complicated, it is recommended by the author.

Marquez (18) recommends the use of an angular trapezoid pointed keratome for glaucoma operations. In sclerotomy *ab externa* this knife prevents injury to the iris even when the anterior chamber is very shallow.

De Saenz Martin (7) reports his technique, prognosis, and indications for the cyclodialysis operation. Forty cases of glaucoma simplex were operated upon with a lowering of tension in 87.5 per cent, higher tension in 2 cases, improvement of vision in 20 per cent of the cases and a decrease in vision in 45 per cent. Very similar results were noted in chronic inflammatory glaucoma. There were 23 cases operated upon with lowering of tension in 86 per cent, visual improvement in 42.8 per cent, and decrease in vision in 33 per

cent Eight cases of acute glaucoma were operated upon with improvement in 5 cases, and decrease in vision in 3 cases Three cases of absolute glaucoma were operated upon and the tension was lowered in 2 The complications consist of hemorrhage into the anterior chamber immediately after the operation, or recurrence in most cases; early hemorrhages were noted in 35 per cent, later hemorrhages in from 12 to 15 per cent According to the author's views, the indications are somewhat limited, in agreement with Von Grosz, they are secondary glaucoma, subluxation of the lens, and aphakia.

Kubik (15) reports on 4 cases of glaucoma in which he removed a clear non-cataractous lens after other methods of treatment had been unsuccessful 1. A case of glaucoma in a partial thrombosis of the central vein (one branch) in which iridectomy had failed to relieve the tension and the anterior chamber remained shallow After an intracapsular lens extraction the tension remained normal 2. A case of chronic glaucoma which became acute after pilocarpine instillation Iridectomy did not cause improvement as there was a bilateral lens sclerosis (lens myopia). The author performed a bilateral lens extraction after a ten-day interval In one eye, the tension became normal, in the other, only after a cyclodialysis 3. A one-eyed patient who had had one eye removed on account of absolute glaucoma The second eye presented acute glaucoma, and an iridectomy, Elliot trephine, and cyclodialysis had been unsuccessful By means of intracapsular lens extraction, the tension continued to remain normal Kubik believes that intracapsular lens extraction in many cases will result in a normal tension when other methods have failed

Laubert (17) believes the foundation of the diagnosis of glaucoma depends upon the careful examination of the vision, visual field, and tension. These factors must be continually observed Even in a successful course of this disease, control examinations should be made at intervals of two months After the performance of an operation, a similar control observation is indicated Medical treatment is indicated only so long as the vision and visual fields do not decrease The tension should be taken only with a tonometer, and the visual fields measured with small test objects, preferably upon a campimeter of Elliot or Bjerrum Any increase in the size of the scotoma indicates that the present method of treatment is ineffectual When this occurs, one should not hesitate to repeat a surgical procedure or attempt another The general physical condition must be considered, especially the blood pressure.

A low diastolic blood pressure indicates a poorer outlook Therefore, one should be very cautious in the attempt to lower the general blood pressure In acute glaucoma, it is absolutely essential that the tension be lowered by one method or another Surgical interference upon both eyes at the same time should be avoided, as the operative procedure upon one eye may sometimes produce a favorable effect upon the second eye and one may avoid the occurrence of a malignant glaucoma. Should one be suspicious of a malignant glaucoma, a posterior sclerotomy should be performed simultaneously with whatever other procedure is indicated In chronic and simple glaucoma, Lauber believes the cyclodialysis to be the operation of choice. In malignant glaucoma, he advises posterior sclerotomy with removal of vitreous, if necessary, and lens extraction.

Denig (6) believes that by making an iris wick in a trephine, Lagrange, or cyclodialysis operation, there is less opportunity for the scleral opening to close and less chance for late infection to occur He states that a scar containing uveal pigment is less apt to become infected than an ordinary scar. In these operations, he proceeds to make a spiral wick out of one angle of the cut iris by winding it around a wire and incarcerating same in the wound This method is most applicable in conjunction with the Lagrange procedure. He states that the tension became normal in 94.7 per cent of the cases which he operated upon This is a rather high percentage.

Lagrange (16) states that the value of iridectomy in acute glaucoma is unquestionable. It is disappointing in cases of chronic glaucoma. The solution of the problem here depends upon the durable fistulization of the eye and establishment of the principle of action of a subconjunctival and limbic sclerotomy, or fistulization of the eye as obtained by the subconjunctival resection at the scleral limbus of a fragment of the ocular shell. He describes the Lagrange iridectomy, with the scleral incision made with a Graefe cataract knife. The fistulizing treatment may thus be accomplished by three operative methods: namely, simple limbic sclerectomy, sclerotomy with peripheral iridian opening, and sclerecto-iridectomy He claims that the fistulizing method succeeds in 85 per cent of the cases in chronic glaucoma, while iridectomy yields an average of from only 25 to 30 successful results in 100 cases He concludes that it is necessary to operate without delay in cases of glaucoma in which medical treatment fails to reduce the ocular tension to normal limits, and operation is necessary, even if the medical treatment does reduce the tension to normal, should

alteration of the visual field progress in the slight est degree or visual acuity decline

Concerning cyclodialysis Gradle states that the operation of cyclodialysis is coming back into favor because of its comparative freedom from danger of disastrous visual results and because of the more permanent normalization of tension due to more careful observance of proper indications. As has been repeatedly emphasized this operation is not a universal cure all for all forms of glaucoma, but must be limited to those cases of compensated glaucoma that are just beyond control with miotics and to those cases of secondary glaucoma which occur subsequent to successful cataract extraction.

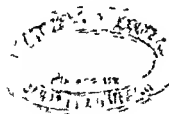
The universal choice of site of the incision through the sclera in cases of compensated glaucoma has been the lower outer quadrant. Of recent years, we have been more successful by operating in the upper outer quadrant. The reason for this is a purely mechanical one. After a properly performed cyclodialysis there is bound to be more or less blood in the anterior chamber because of rupture of the ciliary vessels between the sclera and the ciliary body. This blood tends to settle to the bottom of the chamber, there form fibrinous adhesions in the angle, and completely block the suprachoroidal pathway that has just been made. However, if the upper chamber angle is freed with the cyclodialysis spatula and the patient is then kept upright in bed for twenty four hours the blood will all settle to the bottom of the chamber and thus have no op-

portunity to clog the new angle opening that has been made. It is needless to add that the operation should be followed by the use of a weak mydriatic in all instances.

In the cases of glaucoma secondary to cataract extraction, the site of operation should be chosen so as to free the pillars of the operative coloboma.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EAR

Lempert, J.: Endaural, Antauricular Surgical Approach to the Temporal Bone: Principles Involved in This New Approach; Summary Report of 1,780 Cases *Arch Otolaryngol*, 1938, 27 555

Since the author's first report of 165 complete mastoidectomies performed endaurally ten years ago, he has aimed at the perfection of a surgical operation on the temporal bone through the endaural antauricular approach. His procedure consists of three distinct stages (1) Operation on the superficial soft parts covering the temporal bone, (2) operation on the temporal bone proper, and (3) surgical treatment and guidance of the membranous and osseous wounds resulting from the first two stages

The first stage consists of the creation of a mobile membranous and extracartilaginous window within the external auditory canal for endaural antauricular surgical approach to any desired part of the temporal bone

In establishing an appropriate approach adequate for all types of operations, Lempert enumerates seven desirable factors (1) A series of endaural incisions should be made in the soft parts anterior to the auricle and within the external auditory canal, which will lay the foundation of a membranous endaural window, (2) the endaural incisions must always remain extracartilaginous, in order to obviate the possible occurrence of perichondritis, (3) the window must afford adequate exposure of the temporal bone, (4) the window must be so designed that

it involves the least possible sacrifice of tissues, (5) the window must be made mobile so that it can, together with the auricle, be freely moved and displaced in all desired directions over the temporal bone, (6) the window must be so constructed that it will remain wide open throughout the entire post-operative period of healing, and (7) the window must be so made that it will ultimately heal without deformity

To enable the otologist to satisfy all the foregoing requirements, the author describes a new anatomical landmark which he designates as the antauricular suprameatal membranous triangle, a space filled with connective tissue and containing no important blood vessels or nerves. The surgical employment of this triangular membranous space makes possible the endaural antauricular approach to the mastoid portion of the temporal bone, the mastoid process and the tympanic portion of the temporal bone, and the petrous portion of the temporal bone. The otological surgical procedures which the

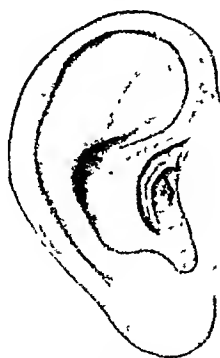


Fig 1 Membranous extracartilaginous endaural window for endaural antauricular approach to the mastoid process

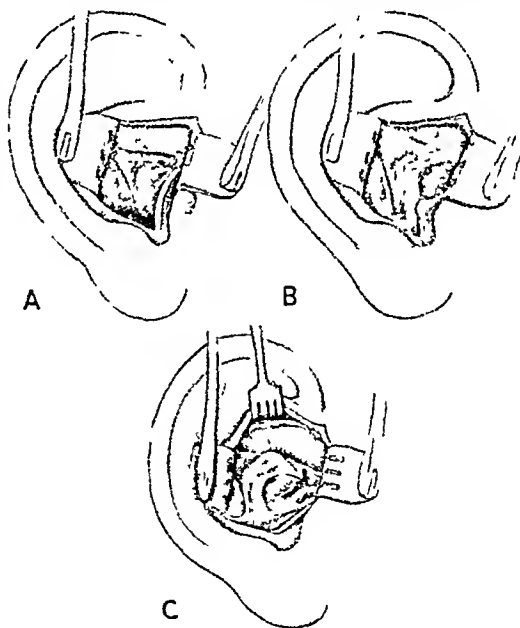


Fig 2 A, complete endaural mastoidectomy (simple mastoidectomy), B, complete endaural mastoidotomy (radical mastoidectomy), C, complete endaural mastoidotomy (mastoid apicectomy)

author has performed in which he has employed the mobile membranous window include the simple mastoidectomy, the modified radical mastoidectomy, complete exenteration of the contents of the lateral sinus for sinus thrombosis, drainage of abscesses in the middle and posterior fossae, removal of obstructive exostoses of the bony walls of the external auditory canal, mastoidotympanolabyrinthectomy, complete apicectomy and drainage of the cisterna pontis interpeduncularis.

In his discussion of the operation on the temporal bone proper, the author describes his method of opening the mastoid antrum through a definitely localized point in the superoposterior bony wall of the external auditory canal. His method Lempert believes is error proof. With this approach to the antrum neither the middle cranial fossa nor the lateral sinus can ever accidentally be injured, no matter how anomalous an anatomical position these structures occupy. The prominence of the external semicircular canal and the transverse portion of the facial canal are never injured because they are anterior and internal to the drill when it enters the antrum. The author strictly adheres to the rule of deliberate, systematic and complete exposure of all the vital anatomical structures. He maintains that a focus of infection no matter how remotely situated cannot possibly escape detection and removal when such a technique is employed.

The author states that by his method the surgical management of the membranous and osseous wounds resulting from operations on the temporal bone assures constant unimpeded drainage of the osseous wound throughout the period of healing, constant vitality of the wound to permit inspection and guidance of the reparative process, a period of healing and convalescence resulting in the least possible social and economic inconvenience to the patient and an ultimately healed osseous and membranous wound the appearance of which approaches cosmetically as nearly as possible the pre-operative appearance.

The author has performed by the endaural approach 1780 operations for suppurative disease involving all parts of the temporal bone and for every possible complication arising therefrom, in patients ranging from one year to eighty years of age and with a mortality of 2.08 per cent.

NOAH D. FABRICANT, M.D.

NECK

Schmidt L. H. and Hughes H. B. The Free and Total Cholesterol Content of Whole Blood and Plasma as Related to Experimental Variations in Thyroid Activity. *Endocrinology* 1938 21 474

The authors investigated experimentally the variations of the total and free cholesterol content of whole blood and plasma in dogs in the following groups: normal and thyroidectomized dogs and normal or thyroidectomized dogs that had been fed thyroxin.

Following thyroidectomy, the total and free cholesterol content of the plasma was increased but the red cells showed no increase. If such dogs received thyroxin, the cholesterol level returned to the pre-operative level. If thyroxin was discontinued the hypercholesterolemia recurred, but very slowly.

Normal dogs, when fed thyroxin showed insignificant variations in either the total or free cholesterol level.

At present there is no satisfactory explanation for the increase in the plasma cholesterol. It may be due to the rate at which these substances are synthesized, excreted, or oxidized or to the rate at which transported fatty acids are oxidized or stored.

FRED S. MODER, M.D.

Goetsch E. Hygroma Colli Cysticum and Hygroma Axillare. Pathological and Clinical Study, and Report of 12 Cases. *Arch. Surg.* 1938, 35 394

The author reports a detailed clinical and pathological study of 12 cases of cystic hygroma. In 10 the growth involved primarily the cervical region and in 2, the axilla.

From a thorough review of the literature and a thoughtful consideration of the etiology of cystic hygroma, the plausible theory is that it arises from sequestrations of lymphatic tissue. In cases of cervical hygroma such sequestrations are derived from the primitive jugular sacs which have failed to join the lymphatic system in the normal manner. Their potentiality of increasing in size to an almost unlimited extent is due to the fact that these 'lymphatic rests' retain their embryonic power of irregular growth.

Predisposing or exciting causes of cystic hygroma are not known.

In the average case there are no local or constitutional symptoms, although there may be cosmetic disfigurement. Symptoms may develop, however, in cases of advanced uncomplicated involvement as a result of pressure on important structures such as the trachea, pharynx and nerve plexuses. Severe respiratory embarrassment may occur when the tumor extends into the mediastinum. The large hygroma has a tendency to become infected secondarily and the infection may be followed by serious symptoms or even death. Anemia and a poor nutritional condition are occasionally noted in children.

Hygroma is a benign true neoplastic tumor of lymphatic origin. It is a multilobular, multilocular cystic tumor, the cavities of which are lined by endothelium characteristic of lymphatic spaces. The fluid content is usually clear or straw colored, occasionally turbid or bloodstained. It is practically free of albumin or globulin and does not coagulate on standing. Various types of leucocytes, phagocytes, fragmented nuclei and cellular debris are noted in specimens which have been centrifuged. Cholesterol crystals occur in cases in which there is hemorrhage. Lymphoid tissue in fact germinating centers and

possibly lymph glands, are formed in abundance in cystic tumors.

Histological evidence is offered as a basis for the explanation of the manner of growth, development, and destructive action of hygromas. Endothelial fibrillar membranes or sprouts from the walls of the marginal cysts penetrate the adjacent normal tissues. A lymph-like fluid is secreted within the fibrils, which are thereby caused to spread apart and canalize. Minute cysts with an endothelial lining are thus formed within these sprouts. By continued secretion within, the cysts enlarge; by pressure atrophy of the walls between adjoining cysts, the large cavities characteristic of hygroma are formed. The fibrillar membranes infiltrate and circumscribe adjacent tissues. Muscle fibers, nerves, or other anatomical units are thereby sequestered and destroyed, either by direct atrophy and fatty degeneration, or by being engulfed and disintegrated in the cystic fluid formed about them.

In the past, diagnosis has often been difficult and confusing, particularly with the more deeply situated tumors. They have been confused with lipomas, branchiogenous cysts, hematomas, angiomas, and tuberculous adenitis. When the true characteristics of these tumors are kept in mind, diagnostic errors should be relatively few. A positive clinical diagnosis can usually be made on the basis of the history and the physical examination.

Early treatment is advisable. Minor surgical procedures sometimes adopted include aspiration, simple incision for drainage, and injection of sclerosing substances. Such procedures are futile in view of the multilocular nature of the tumors and the great danger of secondary infection with severe sepsis. Irradiation has been practiced in the past with indifferent results. For very large tumors in children under six or eight months of age, irradiation preliminary to surgical treatment is desirable. Secondary surgical excision, however, is still necessary for cure. Radical surgical excision is by all means the treatment of choice.

There was but 1 fatality in this series, although the mortality after surgical removal of hygroma has been rather high in the past. The immediate and ultimate results were excellent cosmetically and as regards complications.

In 1 case there was a recurrence of the growth five months after the first operation. Late results following operation for hygroma were observed in 5 instances over periods of from ten months to ten and one-half years. In a case of partial excision of a hygroma which was subsequently treated by high voltage roentgen therapy, the patient, a child, was in good condition fourteen months after operation. In the remaining 5 cases the immediate result was satisfactory, but a late "follow-up" study was not possible.

JOHN H. GARLOCK, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

White J C Sweet W H and Hurwitt E S
Water Balance in Neurosurgical Patients *Ann Surg*, 1938 107 438

In the consideration of fluid loss in neurosurgical patients it is noted that the same factors which are present in ordinary surgical patients plus several other important factors, operate in these patients. The blood loss is considerably greater and the cavity is closed so that changes in the serum protein levels with the accompanying tendency toward the formation of tissue edema play a vastly more important rôle. It is unfortunate that there are no accurate indices of early dehydration. Besides the well known clinical sign the most important laboratory data are (1) the urine volume and specific gravity (2) the red blood count hemoglobin and hematocrit determinations (3) the serum protein, (4) the non protein nitrogen, (5) the body weight and (6) the blood volume. The authors have used the first 4 methods none of which was found to be infallible until the dehydration had reached the advanced stages and the blood volume had begun to fall. One can safeguard the water balance more effectively by appreciating the fluid needs of the patient than by the most careful watching for signs of dehydration.

The importance of insensible water loss during and after operation cannot be emphasized too strongly because of the large volume and because if it is not recognized and adequately replaced it will continue until there is no water left for renal secretion. To reduce the water loss during neurosurgical operations the use of ether should be avoided whenever possible, the temperature of the operating room should not be allowed to go above 80° F and the lightest possible drapes should be employed. In order to combat the fluid loss which is generally more than 1000 ccm and may exceed 25 liters an infusion of 5 per cent glucose in saline solution is started at the outset of the operation. This may be fortified with citrated blood if the condition of the patient requires it. After operation the intravenous infusion is continued on the ward and a total of +1000 ccm of the solution is slowly given during the next four hours. This is all that should be given on the day of operation as the use of more would involve the danger of cerebral edema which is a very real danger in patients who have had their serum protein depleted by inadequate diet or through vomiting prior to operation. The serum protein level must always be elevated to above 5.6 per cent prior to the time of operation. This may be accomplished by transfusion, or by giving the patient a diet that is high in protein.

Edema resulting from the use of too much salt solution is a serious possibility and for this reason the use of glucose in saline solution is limited to the day of operation. Thereafter if the patient is comatose glucose in sterile water is used. For the most part neurosurgical patients are able to take fluids by mouth in adequate quantities. If they do not require a limited intake they should have from 15 to 2 liters of fluids daily. If fever is present, the intake should be raised accordingly up to 25 liters. Generally speaking the specific gravity of the urine should be kept below 1.025. Such intakes of fluid are above those recommended by Fay, and distinctly below those recommended by Collier and Maddock for general surgical patients. Granted however, that the surgeon recognizes the narrow margin of safety and is willing to follow up his patient with the quantitative tests outlined above it is believed that a limited degree of hydration is much safer after operative trauma to the brain than any excess of fluid.

JOHN WILSON & EDWIN M.D.

Hasenjaeger T and Spatz H. Localized Changes in the Configuration of the Brain in Cases of Intracranial Pressure. Obliterative Swelling of the Cisternae and Displacement Across the Midline (*Über örtliche Verengungen, Verschiebung des Gehirns beim Hirndruck. Zitierten Verengung und Verschiebung unter der Medianebene*). *Arch f Psychiat* 1937 107 193

The brain is a plastic mass which in the presence of expanding processes, undergoes a variety of alterations in form such for example as indentations and protrusions. These deformations are frequently accompanied by swelling of the brain. However, a differentiation must be made between localized and generalized swellings of the brain. Local changes of configuration occur at points where extensive external (subarachnoid) liquor containing spaces exist viz the cisternae. Spatz and Stroescu distinguish 6 cisternae: (1) the cisterna magna cerebello-medullaris (2) the ponto-medullaris (3) the basalis (4) the ambiens (5) the fossae sylvii and (6) the interhemispheric. A constant relationship subsists between the cisternae and the herniating brain parts. By the term obliterative swelling (*Ziternverengung*) the authors mean the protruding of a part of the brain into the cavity of the cisternae which empties the latter of fluid. The liquor in these spaces communicates with the various cisternae themselves and with the subarachnoid spaces of the spine. The cisternae ambiens fissura sylvii and interhemispheric correspond to the three great fissures of the brain viz the fissura transversa fossae sylvii and fissura interhemispheric. In these sulci lie the main arteries of the brain: arteria cerebri posterior, media and anterior. In the cisterna

basalis, in which are united the other three cisternæ, lies the circulus arteriosus willisi. The authors describe the herniation of the brain-parts across the midline with photographs and schematic drawings in tumor cases. They discuss the cerebellar tonsils (amygdalæ cerebelli) and their importance to the brain-surgeon in locating the side of the pathology. This phenomenon is not an anatomical anomaly (Arnold). In their opinion a local increase occurs in the volume of the amygdalæ and of the medulla oblongata, whereby these structures fill out the available space within the foramen magnum, viz., the cisterna magna. These enlargements of the tonsil might be a part of a generalized swelling of the brain, or, according to Toennis, they may be the result of local circulatory disturbances.

The authors now discuss the herniation across the midline, "the ring of the protuberating gyri," produced by the enlargement of these gyri. This "ring" is not due solely to the expansive pressure from the tumor since it is found in cases where no expanding process is present. In cases of unilateral tumor of the cerebral hemisphere, the parts of the brain within the ring of the cisternæ are pushed across the midline and present a fungus-like appearance. From this fact it can be seen that the falx cerebri as well as the insertion of the infundibulum of the hypophysis is fixed, and only those parts of the brain lying between these two can take part in the herniation, and the protrusion is most pronounced in the middle. However, the hypophyseal infundibulum is placed on a slant as its origin on the tuber cinereum is carried along by the protrusion process while its insertion on the sella turcica remains fast. The epiphysis which is usually calcified may also assume a slanting posture but to a much less pronounced degree. It is noteworthy that, contrary to what one would assume, the part of the midbrain which is subjected to the pressure is not decreased but rather increased in size. Very excellent photographs and drawings show these displacements as seen from below. There are also 2 pictures taken from the front, the more common exposure.

Cisternal obliterative swelling also occurs, however, in the absence of a brain tumor, as for example, in catatonia (Reichardt) and in epilepsy. However, in these conditions the obliterative process in the cisterna is less pronounced. The diagnosis of swelling of the brain can be made only by means of Reichardt's method. The problem of local brain swellings is still unsolved.

What then do these anatomical findings signify in relation to clinical matters? The displacement across the midline is clearly depicted in the ventriculogram, and in the arteriogram in the fronto-occipital diameter. The obliterative swelling process is particularly noticeable in the regions of the cisternæ magna and ambiens, in the former at the level of the foramen magnum, and in the latter at the incisura tentorii. At both these places important portions of the neural tube were compressed, the

medulla oblongata by means of the cerebellar pressure cone, and the midbrain by the tentorial pressure cone. The general manifestations of intracranial pressure are mostly local symptoms, as shown especially in cases of disturbance of the medulla oblongata with its vasomotor, vomiting, and respiratory-center disturbances. As these structures also take part in the swelling process, this swelling, in turn, increases the amount of pressure on them. The displacements in the region of the cisterna ambiens lead to damage to the region of the peduncles, the corpora quadrigemina, and the arteria cerebri posterior. An important remote symptom is the strangulation of the nervus abducens (Cushing) by one of the lateral branches of the arteria basilaris, whereby many of the instances of abducens paresis in brain tumor may be explained, apparently this phenomenon is essentially a process of obliterative swelling in the cisterna ponto-medullaris. Interesting is the observation of Bailey, operative manipulations under local anesthesia, carried on in the region of the incisura tentorii, give rise to intense frontal headaches. This fact may prove of diagnostic significance in patients with brain tumor who complain of only frontal headaches. The important thing in all these cases of obliterative swelling is that both lumbar and cisternal puncture be strictly prohibited. (FRANZ) JOHN W. BRENNAN, M.D.

Berblinger, W.: Adenomas of the Pituitary Gland.
(Die Adenome der Hypophyse) *Nervenarzt*, 1936, 9
329

While gliomas springing from the posterior lobe of the pituitary gland are quite rare, adenomas which arise primarily in the adenohypophysis are much more frequent. However, the epithelial cells of the adenomas are not always so far matured that the diagnosis of mother-cell, eosinophil-cell, or basophil-cell adenoma can be made from preponderance of one or the other of the three cell forms found in the adenohypophysis. Non-differentiated malignant adenomas can be distinguished from fully differentiated benign adenomas, however, the designation "hypophyseal cancer" is not properly applicable to the former. Only perihypophyseal tumors growing into the gland and hematogenous metastases of other primary carcinomas, especially mammary-gland and pulmonary carcinomas, cause cancer here.

The author reviews the subject of primary adenoma of the anterior lobe. He finds that eosinophil adenomas occur with the same frequency as the basophil variety. Clinically, the former, and probably also the latter (Cushing's disease), are significant because they cause increased hormonal action. It is regarded as questionable whether there is an increased normal action in the case of the mother-cell adenomas also. More probably these tumors lead secondarily to disturbances of function of the anterior lobe, usually in the sense of diminution of the organ activity, by pushing aside the chromophil epithelial cells or pressing on the hypophyseal stem.

This may also be done in the same way by tumors of the craniopharyngeal canal which of themselves are incapable of internal secretion.

Of the effects of adenomas of the pituitary gland the author mentions first the pressure effects: general intracranial pressure and the local pressure effects. General intracranial pressure always occurs late in cases of pituitary tumor, after the manifestation of local pressure effects, it is a chronic pressure. Not only a disturbance of the cerebral circulation, an anemia of the brain plays a rôle in its pathogenesis, but also a certain condition of the brain the nature of which is as yet wholly unknown. It is not the same a cerebral edema, nor is it caused merely by an increase of fluid brought about by the hydrophilic colloids of the brain (brain swelling according to Reichardt). The anatomical bony changes in the sella turcica which develop as a consequence of local pressure are well known. The author investigated the extent of these changes in 25 cases of adenoma. Some may be recognized in the roentgen picture during life. It is only after the adenoma grows out over the sella turcica that pressure injuries occur in the region of the optic chiasm manifested by bitemporal hemianopsia. The inconstancy of the visual disturbances is explained by the changes in the pressure exerted by the tumor. Softenings, which occur so frequently in these tumors, cause the pressure to diminish and hemorrhages into the tumor tissue cause it to increase. Even when pressure is of long standing the result is not necessarily irreparable injury to the fibers of the ocular nerve; the disappearance of the medullary sheath is irregular. In spite of the frequently bitemporal loss of color of the papilla and the ocular nerve atrophy, bilateral choked disk is not generally present even in the presence of large pituitary tumors. Injury to the ocular nerve is possible also from a suprasellar adenoma growing into the basal corona vasculans. It can also cause a reduction of the amount of blood in the arteries and thereby reduce the blood supply to the brain, which result is manifested clinically by a marked desire for sleep. Furthermore the oculomotor nerve can be injured by local pressure and paralyzes of the eye muscles take place. It is of interest to note that fatal hemorrhages into the basal meninges may follow puncture of the pituitary gland.

Great attention must be paid to the hormonal effects proceeding from the adenomas and to the disturbances of pituitary function. In these particulars the eosinophil adenomas which produce the picture of acromegaly are best understood. The eosinophils produce the growth hormone and probably also the thyrotropic hormone in the author's opinion. The enlargement of the supratentorial cortex in acromegaly is regarded by the author not as due to the action of a corticotropic anterior lobe hormone but as a part of the picture of a general splanchnomegaly. An increased secretion of thyrotropic hormone would explain the exophthalmic goiter symptoms which are not unusual in acro-

megaly, similarly the disturbances of the carbohydrate metabolism which are frequently found in acromegaly might be explained by an increased secretion of a hormone with an action contrary to that of insulin. In many cases the capacity to secrete the specific hormone becomes exhausted, the exaggerated growth impulse is checked and the other symptoms are arrested in development. The genital disturbances of acromegaly, amenorrhea and impotence are by no means early symptoms of the disease. They could be explained by partial hypopituitarism which is caused on the one hand by the gradual suppression of the basophil cells which produce the gonadotropic internal secretions which activate the genital glands and on the other hand by the eosinophil cells the action of the gonadotropic secretion being weakened by the growth hormone. The basophil adenomas never attain the size of the adenomas in acromegaly. Cushing has given a detailed description of the disease picture to which they give rise. It is characterized by a peculiar form of obesity, hypertrichosis, striae cutis distensae, a considerable and usually permanent arterial hypertension without disturbance of renal function and osteoporosis. When the tumors do not spread above the sella local pressure effects seldom occur. The pathogenetic importance of the enlargement of the suprarenal cortex often found in this disease has never been made clear. The author believes that it is the consequence of a basophil-cell hyperpituitarism. The individual symptoms of the disease are still difficult of explanation. The statement holds particularly for the osteoporosis which, with arterial hypertension is considered one of the most significant changes in the disease. Clinically the osteoporosis may be manifested as kyphosis of the spinal column.

Concerning the hormone production of the basophil epithelial cells of the anterior lobe of the pituitary gland one cannot speak with as much certainty as of the production of the growth hormone by the eosinophil cells. The author believes that it is suggested that the hormones which initiate activity of the sex hormones the melanophore hormone the interrenotropic hormone and also vasopressin or tonephrin arise in the basophil cells. We are not dealing with basically different internal secretions. Furthermore these secretions do not act directly by way of the blood but by way of the sympathetic nerve centers at the base of the midbrain. Pathogenetically Cushing's disease might be regarded as hypophyseal basophilism.

Other cell adenomas are the most frequent type of adenoma of the pituitary gland. Can hormonal activity be ascribed to them also? There is no particular disease picture which corresponds to adenoma of these chromophobic epithelial cells. Clinically they give rise to symptoms of hypofunction of the gland. Other cell adenomas frequently spread into the suprasellar region, sometimes into the third ventricle. In contrast to their manner of spread is that of the eosinophil adenomas, which extend

downward and forward. The chief disturbances caused by mother-cell adenomas are genital dystrophy and adiposity, but the latter may be absent. If growth in height has not yet ceased, short stature is added to dystrophia adipogenitalis. The genital disturbances (amenorrhea or impotence) are not the expression of basophil-cell partial hypopituitarism; the basophil epithelial cells are greatly reduced in number by the adenoma (even physiologically the basophil cells are much less numerous than cells of other types). Pressure on the metabolic center in the midbrain cannot be the sole determining factor of the adiposity. Much remains unclarified in the pathogenesis of the adiposity. It is possible to distinguish purely hypophyseal and cerebral, more exactly diencephalic, forms of dystrophia adipogenitalis. Summarizing, one may say that in the case of dystrophia adiposogenitalis, as in that of Simmonds' disease, the cause is not to be sought in the hormonal activities of the adenoma cells, but in the consequences of injury to the normal cells of the anterior lobe. The author refuses to ascribe hormonal activities to the cells of the mother-cell adenomas and believes that even the normal mother cells probably do not produce hormones. The mother cells are to be regarded as outlet cells for the chromophil cells which develop from them.

In his conclusion, Berblinger reports his observations as a pathologist in respect to the various therapeutic methods. Mention has already been made of the danger of puncture of the pituitary gland. Emphasis is placed on the great danger of the occurrence of suppurative meningitis following operation by the endonasal route, three deaths from meningitis of this origin are reported. In the opinion of the author, in every irradiation of adenomas account must be taken of the fact that with the disintegration of the tumor (adenoma cells are more radiosensitive than normal epithelial cells of the pituitary gland) extensive capillary hemorrhages occur, which lead to renewed enlargement of the tumor and further pressure. Also, portions of the pituitary gland which have remained normal may be endangered by the irradiation. In operating on adenomas one should always think of the preservation of pituitary tissue capable of carrying on function. (HANS HANKE) FLORENCE A CARPENTER

Lysholm, E.: Radiological Experience in Ventriculography. *Brit J Radiol*, 1938, 11 273

From a large series of cases, 3,285, studied by means of air or lipiodol injection into the ventricles or into the lumbar canal, and another smaller series studied by arteriography, the author has selected 806 cases verified by ventriculography for this paper.

A small amount of air was injected and many pictures were taken with the air bubble in various parts of the ventricular system. Stereoscopy was not used but a biplane exposure has been perfected which calls for a special radiographic technique. The purpose, of course, was to obtain information regarding the exact localization of tumors.

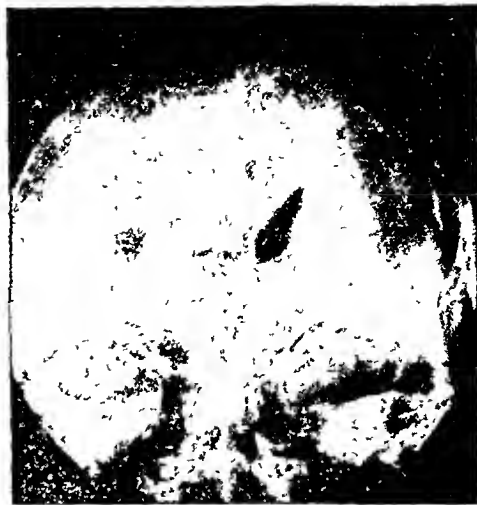


Fig 1 Parasagittal tumor. The ventricular system is displaced, and the septum and the third ventricle are inclined from the tumor side, but remain nearly in line with one another. A line drawn through the septum and the third ventricle makes, with the mid-vertical line of the skull an angle open upwards. The lateral ventricle on the tumor side is compressed from above, and the other lateral ventricle is somewhat distorted, flattened from side to side and elongated upwards.

The author lays great stress on the filling and alteration in position of the temporal horn in temporal lobe, and indeed all supratentorial, tumors. He also believes that he can determine the operability of tumors in the posterior part of the third ventricle. The method seems particularly applicable to small parasagittal tumors. ADRIEN VERBRUGGEN, M D

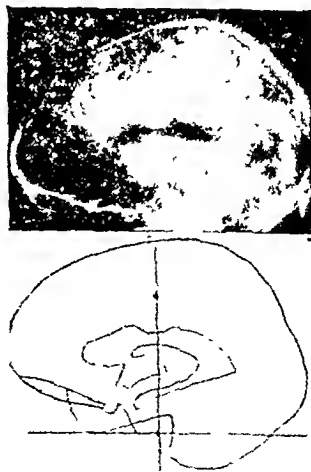


Fig 2 Parasagittal tumor.

PERIPHERAL NERVES

Leriche R. The Surgical Treatment of Essential Hypertension (Réflexions sur le traitement chirurgical de l'hypertension artérielle solitaire) *Presse Méd* Par 1938, 46 489

Leriche operated upon 29 patients with essential hypertension. Though this is a small series compared to the large numbers of cases treated operatively in America or in the frequency of the disease itself, he believes he can draw valuable conclusions from them as an aid in orientation in the problem since he knows his patients personally and has followed them for a long time.

He has found that the results of unilateral splanchnicectomy were transient and practically valueless and that the bilateral operation while giving some what more lasting results never produced a true or permanent cure. Adrenalectomy alone effected only "half a cure." The author has had his best results from a unilateral adrenalectomy and lumbar ganglionectomy on the same side at one stage, followed by a section of the splanchnic nerves on the other side with or without ganglion ablation on that side.

His outlook at present on the surgical treatment of hypertension is one of some doubt and he seems to have more contra indications than indications for surgery. He believes that the steady progression of the disease (over a period set aside for observation) is a contra indication to surgery since, hypertension being a symptom, the basic causative factor is progressive. He feels that the solution of the problem lies in the eventual understanding of the hormonal (adrenal) factor in the disease. He believes that it is to be solved by clinical rather than by experimental studies for he thinks that the hypertension of human beings and that of experimental animals are entirely different matters and not to be compared either as to cause or as to results of surgical treatment. JOHN MARTIN M.D.

Page, I. H. The Medical Aspects of Surgical Treatment of Hypertension *J Am Med Ass* 1938 110 1261

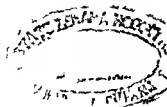
This report is a summary of the author's observations, experiences and opinions concerning the surgi-

cal care of 29 hypertensive patients who were operated on by Heuer. Heuer performed a section of the anterior spinal nerve roots on 20 patients and resected the lower thoracic ganglia and splanchnic nerves on the other 9.

Page has made a brief but distinct differentiation between the types of hypertension, essential and malignant, and indicates the protean nature of each. The patients were studied pre-operatively for a practical period but as no criteria for the selection for surgery were known to the investigators, patients with various types of hypertension in various stages of the condition were chosen. The author found that the tests usually employed to determine vascular flexibility were not altogether reliable.

Anterior root section is a formidable operation and when done by Heuer (usually in two stages) 11 unfortunate surgical accidents occurred. Young persons with essential hypertension and patients with malignant hypertension showed definite improvement after operation but patients with older, long standing cases did not seem to benefit by surgery and it is Page's view that most patients with essential hypertension can still be treated best by medical means.

The patients on whom splanchnic nerve resections were done all responded with a marked drop in pressure for a matter of days or weeks but by the end of nine months the pressure had returned to the approximate pre-operative level. With this operation subjective improvement was marked in most of the cases of essential hypertension but in them as well as in the cases of malignant hypertension the effects were too transient to be called successful. The author believes that if a larger series of splanchnic resections could be studied more favorable results as compared to root section might be expected. The relative simplicity of the operation speaks for its preference. He thinks that the surgical treatment of hypertension is still definitely experimental, that the results now being obtained are far from ideal and above all that it is not at all certain what may be the theoretical basis for operation in cases of hypertension in which large vascular areas are denervated. JOHN MARTIN M.D.



SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Decker, H. R.: Experience with Collapse Therapy for Pulmonary Tuberculosis in the Fifth and Sixth Decades. *J Thoracic Surg*, 1938, 7 351

The author presents the results of collapse therapy in a series of 154 patients between the ages of forty and sixty years. Of these, 135 were between forty and fifty years of age and 19 were beyond the age of fifty years. About 50 per cent of the patients had productive fibrous lesions, 25 per cent were found to have productive and exudative lesions combined, and 25 per cent were predominately exudative. In half of the cases, more than the equivalent of one lung was diseased. Cavitation was present in 69 per cent of the group, and 9 of every 10 cavities were apical, or were located in the upper lobe. From an economic standpoint, the earning capacity of these patients was zero.

A number of the patients refused the author's choice of procedure but accepted a less efficient one. In the cases of 114 patients, treatment was carried out for six months to two years, in the cases of 25 patients, treatment was given for from two to five years, and in the cases of 15 patients, treatment extended over a period of from five to ten years.

The author found collapse therapy to be of great value for patients in the fifth and sixth decades of life. While good results are not obtained as frequently as might be anticipated in the cases of younger patients, yet a sizeable number are restored to health and earning capacity. Many successful results are obtained when least expected.

In discussing the various collapse procedures, the author states that artificial pneumothorax is possible to the point of satisfactory collapse in a much smaller percentage of patients after the age of forty, and selective collapse is less likely to be obtained because of the greater frequency of adherent pleuritis. Pneumothorax should be tried as a primary procedure before other methods of treatment because of its relative safety, but if a satisfactory collapse does not take place it should either be discontinued without delay, or should be supplemented by other types of operation.

Operation on the phrenic nerve has been more successful than any other method of treatment. However, in basilar pleuritis, because of the fixed diaphragm, little may be expected of phrenic nerve paralysis, nor is it to be expected that very thick-walled cavities in the midst of extensive productive lesions, or close to the periphery of the lung, will be influenced frequently by this procedure.

Plombage is a very valuable adjuvant in the treatment of patients in this age group, particularly in bilateral disease, and may easily accomplish at a minimal risk the same results produced by thora-

coplasty. The author does not know how innocuous this paraffin pack will prove to be. From his observations, the pleura in patients with apical disease has proved to be thick and well fortified against perforation and its attendant complications. On the basis of his experience with individuals below the age of forty years, he believes that plombage is a valuable operation also for cavitation in the middle and lower lung fields.

Thoracoplasty is needed and should be utilized, but with greater precaution and hesitancy in this age group than in the earlier age groups. The fact that some mortality will occur and that the mortality rate will be higher than that in the earlier age groups should not be a deterrent to thoracoplasty, but should make one more willing to try other procedures first. There can be no question as to its value in the production of a most positive and expeditious form of collapse. EARL O. LATIMER, M.D.

Schenck, S. G., and Hochberg, L. A.: Clinico-roentgenological Considerations of Acute Thoracic Empyema. Thoracic Complications and Sequelæ in the Non-Tuberculous Form. *Am J Surg*, 1938, 39 561

Difficulty and uncertainty are often experienced in eliciting physical signs in the chest of a patient with postoperative empyema. However, most of the complications and sequelæ which occur in acute empyema are readily demonstrable by roentgenograms of the chest.

X-ray examination is the most satisfactory method of determining the presence or absence of retained fluid, as well as the localization of pockets of pus. It makes the demonstration of adhesions relatively easy and gives considerable information regarding the appearance of the lung. It shows compression of the lung and the cause thereof. Pulmonary suppuration or abscess formation, and fistulous tracts between the pleura and bronchi can be seen by means of the x-rays, and observations on the mediastinum can be made. Mediastinal adhesions are characterized by a fixation of the mediastinum. Shifting of the mediastinum and the localization of pus can also be demonstrated.

The position of the heart may be affected by empyema, or purulent pericarditis may occur. Both of these conditions as well as variations in the diaphragm and the motility of the diaphragm can be observed by means of the x-rays. Observation of the ribs overlying the area of empyema may help to make an early diagnosis of osteomyelitis. The extent and size of a persistently draining sinus tract may be visualized after an injection of iodized oil, and spinal deviation may also be observed. Extraneous shadows caused by drainage tubes or a gauze sponge accidentally left in the chest are frequently valuable diagnostic signs.

PERIPHERAL NERVES

Leriche R The Surgical Treatment of Essential Hypertension (*Réflexions sur le traitement chirurgical de l'hypertension artérielle solitaire*) *Presse méd* Par 1938, 46 489

Leriche operated upon 29 patients with essential hypertension. Though this is a small series compared to the large numbers of cases treated operatively in America, or to the frequency of the disease itself, he believes he can draw valuable conclusions from them as an aid in orientation in the problem, since he knows his patients personally and has followed them for a long time.

He has found that the results of unilateral splanchnicectomy were transient and practically valueless and that the bilateral operation, while giving some what more lasting results, never produced a true or permanent cure. Adrenalectomy alone effected only half a cure! The author has had his best results from a unilateral adrenalectomy and lumbar ganglionectomy on the same side at one stage, followed by a section of the splanchnic nerves on the other side, with or without ganglion ablation on that side.

His outlook at present on the surgical treatment of hypertension is one of some doubt, and he seems to see more contra indications than indications for surgery. He believes that the steady progression of the disease (over a period set aside for observation) is a contra indication to surgery, since, hypertension being a symptom, the basic causative factor is progressive. He feels that the solution of the problem lies in the eventual understanding of the hormonal (adrenal) factor in the disease. He believes that it is to be solved by clinical rather than by experimental studies, for he thinks that the hypertension of human beings and that of experimental animals are entirely different matters and not to be compared either as to cause or as to results of surgical treatment.

JOHN MARTIN M.D.

Page I H The Medical Aspects of Surgical Treatment of Hypertension *J Am M Ass* 1938 110 1161

This report is a summary of the author's observations, experiences and opinions concerning the surgi-

cal care of 29 hypertensive patients who were operated on by Heuer. Heuer performed a section of the anterior spinal nerve roots on 20 patients and resected the lower thoracic ganglia and splanchnic nerves on the other 9.

Page has made a brief but distinct differentiation between the types of hypertension, essential and malignant, and indicates the protean nature of each. The patients were studied pre-operatively for a practical period, but as no criteria for the selection for surgery were known to the investigators, patients with various types of hypertension in various stages of the condition were chosen. The author found that the tests usually employed to determine vascular flexibility were not altogether reliable.

Anterior root section is a formidable operation and when done by Heuer (usually in two stages) 3 unfortunate surgical accidents occurred. Young persons with essential hypertension and patients with malignant hypertension showed definite improvement after operation, but patients with older, long standing cases did not seem to benefit by surgery and it is Page's view that most patients with essential hypertension can still be treated best by medical means.

The patients on whom splanchnic nerve resections were done all responded with a marked drop in pressure for a matter of days or weeks, but by the end of nine months the pressure had returned to the approximate pre-operative level. With this operation subjective improvement was marked in most of the cases of essential hypertension, but in them, as well as in the cases of malignant hypertension, the effects were too transient to be called successful. The author believes that if a larger series of splanchnic resections could be studied, more favorable results as compared to root section might be expected. The relative simplicity of the operation speaks for its preference. He thinks that the surgical treatment of hypertension is still definitely experimental, that the results now being obtained are far from ideal and above all that it is not at all certain what may be the theoretical basis for operation in cases of hypertension in which large vascular areas are deteriorated.

JOHN MARTIN M.D.



HEART AND PERICARDIUM

Basset. A : A Case of Cardiac Symphysis Treated by Precordial Thoracotomy, Brauer's Operation; Result at the End of Two and One-Half Years (A propos d'un cas de symphyse cardiaque traitée par la thoracotomie précordiale, opération de Brauer. Resultat au bout de deux ans et demi) *Mem l'Acad de chir*, Par 1938, 64: 384

Basset reports a case of cardiac symphysis in a young man twenty years of age, who at sixteen had had an acute febrile attack with pericardial involvement. From that time he had increasingly severe cyanosis, dyspnea, oliguria with ascites, hydrothorax, edema of the legs, and painful enlargement of the liver. Radiological examination showed nodular infiltration of both lungs, and there were recurrent attacks of fever. As medical treatment proved unavailing, operation was necessary. Precordial thoracotomy was done by Brauer's technique from the third to the sixth rib. Convalescence was complicated by two attacks of phlebitis, three short febrile periods, and one crisis of pulmonary edema. However, at the end of two years and a half, the patient's condition was definitely improved. The dyspnea and cyanosis were relieved and the edema had disappeared, the pulse was regular and the electrocardiogram more nearly normal, the size of the liver was reduced. The patient was not cured; his activities had to be limited, his daily régime carefully regulated, and medication resorted to from time to time.

Precordial thoracotomy for cardiac symphysis does not usually result in complete cure. The pain, dyspnea, and cyanosis are usually relieved promptly, but the edema, scrous effusions, and the enlargement of the liver subside much more slowly and with occasional exacerbations. Patients who have been operated upon must be followed up for a long period, in order that the ultimate results may be determined. The immediate postoperative mortality is relatively small, but a larger percentage of patients dies within the first year, according to statistics given by various surgeons.

The resection should be sufficiently large and include at least four ribs, and in young patients at least, it should be extrapleural as in the author's case, in order that re-formation of the plastron may be prevented. The author states that results may be improved in cases in which there are adhesions between the pericardium and the diaphragm by the combination of phrenicectomy as a preliminary measure.

ALICE M MEYERS

Murray, G., Wilkinson, F. R., and MacKenzie, R.: Reconstruction of the Valves of the Heart. *Canadian M Ass J*, 1938, 38: 317

The work of these authors is a continuation of experiments on the cardiac circulation in the University of Toronto. This report is based on experiments in intracardiac surgery, in which the heart valves were resected and successfully replaced by venous grafts.

The lateral cusp of the mitral valve was resected by means of an approach to the valve through the apex of the auricle. Eight control animals died within six days, several within twelve hours. In 8 others, resection of the lateral mitral cusp was carried out, and in 6 of these the valve was immediately replaced by a venous graft. Two of these animals are alive and well six months after the operation.

The cardiovalvulotome was passed through a small opening in the apex of the left auricle, and a purse-string suture was tightened around the opening to prevent leakage of the blood. The instrument was passed through the mitral ring and the blade was allowed to open. The lateral cusp of the valve was picked up in the notch of the instrument and a piece of valve, from 8 to 10 mm, was excised and the instrument withdrawn. The opening in the auricle was closed with a ligature.

About $3\frac{1}{2}$ in. of jugular vein were excised and turned inside out so that only the endothelial lining was in contact with the blood stream. A silk suture was attached to each end and with one of these the vein was drawn into a cannula, which was then passed through the anterior heart wall, across the cavity of the heart, to emerge on the posterior side of the left ventricle. The suture on the end of the vein was grasped, the cannula was withdrawn, and the vein was left across the cavity of the heart. The new valve was thereby placed in the heart so that it would lie in the line of the resected valve. Both ends of the new valve were sutured to the epicardium of the left ventricle.

Immediately following the placing of the new valve, the increasing dilatation and cyanosis of the heart ceased, the heart rate improved, and the cyanosis of the dog's tongue subsided.

During the resection of the valve in some of the animals, the ventricle began to fibrillate and the rhythm could not be restored. If resection of the valve had been carried out successfully, all the dogs would have survived the operation of placing the new valve. There are two surviving animals which are quite well, without signs of edema or heart failure. They can take their part with the other dogs in the runway. There are soft systolic murmurs in the hearts of both animals.

J. DANIEL WILLEMS, M.D.

MISCELLANEOUS

Gamble, H. A.: Tracheo-Esophageal Fistula. *Ann Surg*, 1938, 107: 701

Gamble reports a case of congenital atresia of the esophagus with tracheo-esophageal fistula. This condition, although rare, is being recognized more frequently. All patients whose cases have been reported have ultimately succumbed, most of them dying within the first fortnight. The surgical procedures previously attempted are reviewed, beginning with Richter's operation in 1913; and the operation of Mixer, Gage, and Levens is mentioned.

The author believes that a careful systematic survey by roentgenography will explain and clarify the patient's clinical course. EARL GARSIDE, M.D.

Woodruff W. Tuberculous Empyema. *J Thoracic Surg* 1938 7 420

This paper is a report on a study of 154 patients under the care of 12 physicians. Of these, 134 had a follow up of from three to eight years and 20 of less than one year.

Tuberculous empyema is defined by the author as "any turbid pleural fluid in the presence of pulmonary tuberculosis, or any fluid containing tubercle bacilli on direct smear. There were 47 known persistent bronchopleural fistulas, and 42 known secondary infections. In 137 cases the empyema complicated an artificial pneumothorax. In 12 it began as pleurisy with effusion.

Of the entire series of 154 patients 64 are dead. The death rate was about 30 per cent in this unoperated tuberculous group and approximately double that for the mixed infections and for fistulas.

The progressive stages of a tuberculous pleurisy are recurrent serous effusions in pneumothorax for tuberculosis seropurulent effusions, and thick tuberculous pus. At any stage there may be secondary infection or rupture to the outside either through a bronchus or through the chest wall.

For the purpose of evaluating the treatment given in these cases the author places all patients without secondary infection into Group A, and those with secondary infection into Group B. Aspiration only is of value in Group A. 40 per cent of the patients recovered without further treatment and 40 per cent died. It is of no value in Group B. Irrigation with salt solution and dyes was of some value in both groups especially in Group B, in the preparation of patients for later thoracoplasty. Oleothorax was of great value in Group A and 50 per cent of the patients recovered without further treatment, however it was of no value in Group B. The use of the tube and thoracotomy are contra-indicated in Group A but they are frequently required in Group B. Of the patients 65 per cent are dead. Thoracoplasty is of great value in both Groups A and B. The better the patient's condition is and the thinner the pleura the better are the end results.

J. DANIEL WILLEMS, M.D.

Arce J. Brea M. V. and Talana J. A. Primary Tumor of the Pleura (Tumor primitivo de la pleura). *Boletín de la Univ. de Buenos Aires* 1938 14 10

The authors observed the case of a forty nine year old Italian man, whose condition dated back to three years before at which time he began to complain of pain localized at the base of the right thorax. He attributed this pain to a previously sustained cholecystectomy. There was no fever, cough or expectoration.

On physical examination the patient presented an emphysematous chest and on palpation he com-

plained of pain along the seventh and eighth intercostal spaces on the right side especially at the level of the scapular line. Percussion of the right chest revealed the presence of a round zone of dullness of about 11 cm in diameter located just below the inferior angle of the scapula and covering the seventh and eighth intercostal spaces. Auscultation revealed vesicular breathing throughout the chest. Roentgenological examination showed the presence of a rounded mass extending from the sixth to the eighth rib well separated from the mediastinum and the diaphragm. The opacity was uniform and the ribs could be distinguished through it. In profile exposure the mass was found to be distinctly posteriorly and it assumed a semi oval aspect. With the aid of an artificial pneumothorax the mass was found to be non-displaceable. A diagnosis of intrathoracic tumor was made. Inasmuch as the tumor was evidently originating from the thoracic wall and because of the long clinical course of the condition a primary fibrosarcoma of the pleura possibly undergoing malignant transformation was suspected.

Under novocaine anesthesia a rib resection was performed and the pleural cavity was exposed at the level of the ninth intercostal space. The tenth rib was found to be free. During the operation the patient showed signs of collapse and he died thirty six hours later. Autopsy showed fatty infiltration of the heart muscle and slight atheromatous changes of the aorta. Examination of the specimen removed at operation revealed a mass about the size of a small orange adherent to the resected rib. The tumor was enveloped in a fibrous capsule showing a plane of cleavage at the seventh and eighth rib. The ribs appeared to be destroyed at the point of contact with the tumor.

Microscopic examination showed the presence of collagenic fibers and adult fibroblasts. The nuclear elements predominated over the fibers. The histopathological picture was that of a fibroma but there were a few characteristics of a neurofibroma (schwannoma) probably originating from an intercostal nerve.

In a discussion of this subject the authors point out that small tumors of the pleura do not give rise to subjective complaints and remain latent as a rule but if they attain a large size the patient presents definite symptoms. The rate of growth of neurofibromas is notoriously slow whereas neurofibrosarcomas grow rapidly. The pain is usually localized at the site of the tumor and may radiate along the course of the involved nerves. Another important diagnostic sign of intrathoracic neurofibromas is the ease with which these tumors can be displaced.

Intrathoracic neurofibromas are rare but a few cases have been reported in the literature. The pathological diagnosis is often difficult because of the many possibilities of interpretation.

Treatment is always surgical. Considerable technical difficulties are encountered if the tumor mass is large.

RICHARD E. SOMMA, M.D.

PERITONITIS

A Collective Review of the Significant Literature for Six and One-Half Years

HAROLD D. HARVEY, M.D., and FRANK L. MELENEY, M.D., F.A.C.S., New York, New York

IN July 1931 one of us attempted to review the recent significant literature on the subject of peritonitis. The report appeared in Nelson's *Loose-Leaf Surgery, Surveys of Current Literature* (93). The present article has continued the study up to the end of 1937. During these six and one-half years, over 1,500 articles relating to peritonitis have appeared in medical journals. This statement indicates that there is widespread interest in a problem which is far from being solved. It is a complex problem with many facets, involving questions, not only concerning the membrane itself, which is an extensive serous surface equal in area to the surface of the skin, but concerning the function of the numerous contained organs. In spite of the large number of articles which has appeared, there are only a few significant advances in our knowledge of this extremely important phase of general surgery. Although these reports cover very much the same ground indicated by our previous review, there is a somewhat altered emphasis. Much more attention is being paid to the prophylactic measures which may be applied to peritonitis by means of various vaccines, and to special measures for its cure, particularly by means of sera and ultra-violet light. The papers in general group themselves under the following headings:

- I. Anatomy
- II. Physiology
- III. Pharmacology and chemistry
- IV. Bacteriology
- V. Clinical aspects
- VI. Prophylactic treatment
 - A. Vaccine
 - B. Amniotic fluid
 - C. Filtrate
 - D. Bacteriophage
 - E. Miscellaneous
- VII. Active treatment
 - A. Operative
 - B. General
 - C. Serum
 - D. Bacteriophage
 - E. Ultra-violet light

From the Bacteriological Research Laboratories of the Department of Surgery, Columbia University, College of Physicians and Surgeons, and the Presbyterian Hospital, New York City

I. ANATOMY

The question of the routes of spread of free fluid coming from a perforated viscus within the peritoneal cavity has been reviewed by Pantin (117). The routes he describes are: (a) from a perforated duodenal ulcer to the right flank and right diaphragm with right shoulder pain, (b) from a high gastric ulcer to the left flank and diaphragm, with left shoulder pain usually appearing later than the abdominal pain, (c) from a gastrojejunal ulcer along the right side of the mesentery into the right lower quadrant, (d) from a ruptured ectopic pregnancy through either flank to the diaphragm, (e) from a ruptured spleen to the left diaphragm, with pain first in the shoulder and then in the flank. All of the symptoms in such cases are based on anatomical arrangements within the abdominal cavity.

Allen (2) has photographed frogs' red blood corpuscles entering stomas in the diaphragms of mice after intraperitoneal injection. He was not able to demonstrate stomas anywhere except in the diaphragm and is of the opinion that they are open when the diaphragm is relaxed, and are closed by the contraction of this muscle.

This work is partly confirmed by the observations of Menkes (97) who injected a colloidal suspension of thorium dioxide into the peritoneal cavity of guinea pigs and rabbits, and took x-ray films at various intervals. Immediately after the injection, the material spread uniformly throughout the peritoneal cavity and after from three to five hours the lymphatic vessels were outlined in the anterior cupola of the diaphragm, and were shown to converge into two parallel lines leading to the retrosternal nodes and intercostal lymphatics.

II. PHYSIOLOGY

A. Absorption of solutions and particulate matter.

Many investigators have injected various materials into the peritoneal cavity and have made observations on the physiology of peritoneal absorption of both solutions and suspensions of insoluble material. Many of these studies were made under conditions that do not occur in real life and the authors' conclusions are based on two questionable premises: first, that the substances injected behave in a manner similar to solutions

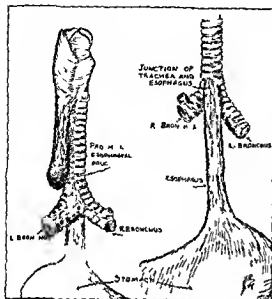


Fig 1 Sketch showing anatomical relations found at autopsy. The proximal esophageal pouch ended blindly posterior to the trachea just above the bifurcation. At the same time there was a fistulous communication between the anterior surface of the trachea and the distal segment of the esophagus. (Courtesy of J. B. Lippincott Co.)

The surgical approach to this problem is either by direct or indirect attack of the lesion. For the latter method at least three stages are necessary. The objects in the first stage are (1) to provide means for nourishment (2) to prevent regurgitation of food and (3) to prevent pulmonary complications. The second stage is concerned with the reconstruction of the esophagus and the third stage deals with the re-establishment of the continuity of the gastrointestinal tract.

An ingenious operation, designed to fulfill the above requirements was performed by Gamble in the case presented. The stomach was delivered

through an incision to the left of the midline and completely transected at its upper fourth between small modified Payr clamps. The proximal end of the distal segment was then completely closed and a gastrostomy of the Stamm type accomplished at the same time, the gastrostomy tube being brought out through a stab wound to the left of the incision. In this manner regurgitation of the food into the lungs was completely eliminated. The site for division at the upper fourth of the stomach was selected in order that the esophageal end of the stomach would have a sufficient amount of stomach tissue left to enable one finally, after ultimate reconstruction of the esophagus to re-establish the continuity of the gastrointestinal tract by anastomosing the two segments of stomach. The proximal fourth of the stomach was then brought out at the upper angle of the wound and after closure of the incision the Payr clamps were removed and the stump was sutured to the skin. This is an important step toward the prevention of pulmonary complications as it provides free drainage of the whole bronchial tree. It is surprising to note the large amount of fluid that drains from this esophageal stump. Any operation which closes the esophagus creates a blind pouch which rapidly fills with secretions which inevitably regurgitate into the lungs and are an active factor in the causation of the pulmonary complications from which most of the patients succumb. The provision for free drainage is an essential feature of the operation. An esophagostomy of the proximal esophagus later removes any further menace to the lungs.

The infant unfortunately developed bleeding from the wound which necessitated re-opening and at that time a bleeding point was found on the lesser curvature of the stomach. This was secured and ligated but death occurred on the fifteenth day. Autopsy disclosed general peritonitis secondary to the perforation of an ulcer on the anterior wall of the stomach. The lungs were not involved in any way.

This case demonstrates the practicability of transection of the stomach to prevent regurgitation and the benefits accruing from drainage of the esophagus in the prevention of pulmonary complications.

JACOB M. MORA, M.D.

tion is made, or have ignored the dilution factor of the fluid portion of the exudate

Seeley, Higgins, Mann, and Dixon (156), however, working with rats, determined the total number of peritoneal cells by counting the number of each type in each c.mm. and by weighing blotting paper before and after absorption of the total peritoneal fluid. Their total counts were mononuclears, 18,000,000, eosinophiles, 3,000,000, basophiles, 1,000,000, and neutrophils, 18,000. They injected amniotic fluid concentrate, Barger's colon bacilli and non-hemolytic streptococcus vaccine, and 2 per cent ricinoleate. After all injections, the polymorphonuclear leucocytes increased rapidly and reached a peak in from three to six hours. The mononuclears, on the other hand, increased gradually for a period of six days. The ricinoleate gave the most striking effect.

Similar work was done by Corwin (25, 26) who found that the cells increased from 1,800 to over 100,000 per c.mm. after injection of Barger's vaccine. Whereas the count per cubic millimeter after injection of sodium ricinoleate was only 40,000, the total amount of fluid was so much greater that a greater total number of cells was evoked by the ricinoleate than by Barger's vaccine.

Pons, Gannon, and Belk (125) found that while the leucocytes were pouring into the peritoneal cavity after the intraperitoneal injection of bacillus coli vaccines in 2½ per cent gum tragacanth, there was a fall in the leucocytes of the peripheral blood. The same result was obtained with 5 per cent of aleuronat in gum tragacanth and the workers believe that this indicated a "withdrawal phenomenon."

D Peristaltic function

Namikawa (106) made certain observations on the peristaltic action of the gut. He found that almost any substance injected into the peritoneal cavity of animals slowed peristalsis, and electrical or mechanical stimulation of almost any part of the parietal peritoneum caused a reflex slowing of peristalsis, which could be prevented by cutting of the splanchnic nerves or by cutting of the cord at the second dorsal segment. After ligation of the blood vessels, stimulation of the splanchnic nerves produced no change in peristalsis, which suggested that the reflex passes through the sympathetics in the walls of the blood vessels.

Imanaga (70) placed glass windows in the abdominal walls of dogs and rabbits and observed peristalsis in the intestines following the intraperitoneal injection of certain irritating substances. When he injected Lugol's solution he found that the small gut went into spasm

wherever the solution touched it. The spasm was followed by a local slowing of the blood stream and local atony of the gut. When he produced local peritonitis by the injection of bacteria, he likewise found a local slowing of peristalsis, which could be corrected by the intravenous administration of saline solution or blood. Only in diffuse peritonitis was the gut affected extensively. Imanaga believes that the lowered blood pressure in diffuse peritonitis and the subsequent slowing of the blood stream cause an accumulation of acid in the intestinal wall which is responsible for atony of the gut and loss of peristalsis. When he examined the blood of the portal vein in animals with diffuse peritonitis, he found a lower pH, a lower sodium chloride content, and a marked lowering of the oxygen content.

III. PHARMACOLOGY AND CHEMISTRY

A number of authors have studied the effect on distant parts of the body resulting from or following the injection of various materials into the peritoneal cavity.

A. Blood chemistry.

Hasama (58, 59) found that the blood sugar was increased in proportion to the degree of peritonitis, and that the adrenalin content of the blood and also of the adrenals was promptly elevated. On this basis, he believed that adrenalin was contra-indicated in peritonitis and that insulin should be used. Katsuragi (79, 79a), however, observed that the initial rise of adrenalin was followed by a fall, and this seemed to him to be a definite indication for the administration of adrenalin. Confirmatory evidence lay in the histological examination which revealed hemorrhages, fatty degeneration, and atrophy of the adrenal cells.

Hashimoto (60) found the same histological changes in the pancreas following peritonitis.

Tabanelli (178, 179) noted a fall in the cholesterol content of the blood, adrenals, and liver, but a rise in the cholesterol content of the spleen, in experimental animals suffering from peritonitis. In 33 patients with acute peritonitis, he recorded a fall in blood cholesterol, which continued progressively in those who died, but the cholesterol returned to normal in those who recovered.

Okada (114) produced peritonitis by perforating the small intestine of dogs just above the appendix by means of a hot iron. He then studied the blood chemistry and found an increase of nitrogen, increased viscosity, a fall in the chlorides, delayed clotting time, and a delayed sedimentation rate. All of the animals died from

or suspensions which do occur in the peritoneal cavity, and, second, that the method of absorption in man and animals is the same. In general the authors determined the route of absorption by a study of the lymph from the thoracic duct and the blood from the portal vein.

Schechter (147) believes that in the uninfamed peritoneal cavity, the laws of diffusion and osmosis govern the absorption of substances other than proteins. The mechanism of the absorption of proteins is not yet established. When normal saline glucose or salt bicarbonate solutions were injected into the peritoneal cavity, they all gradually took on the electrolytic composition of edema fluid and were absorbed at a constant rate.

Sato (145) believes that soluble substances are absorbed by the blood stream, and particulate matter by the lymphatics, especially those of the omentum and diaphragm. When these systems are blocked, there is no delay in the absorption of soluble substances, but there is a delay in the absorption of particulate matter.

The results of De Vincentis (37) are somewhat different from those of Sato, as he observed that the removal of the omentum delayed the absorption of certain solutions, but did not consistently delay the absorption of organisms.

Teshima (180) confirmed the absorption of particulate matter by the lymphatics of the diaphragm and found that the process went on for an hour and a half after the death of his animals.

Mengle (96) found that the absorption of particulate matter was more rapid under ether anesthesia than under sodium amytal or local anesthesia probably because of the activity of the diaphragm, and Friedrich (42) concluded that absorption was dependent upon heart action, tonus of the splanchnic vessels, peristalsis, and respiration.

Laird (89) observed that substances such as arsenic, phosphorus, and sodium iodide injected intraperitoneally all produced a fatty infiltration of the liver and that this action could be greatly delayed by ligation of the portal vein.

Piemu (123) found that phenolphthalein injected into the peritoneal cavity was rapidly eliminated in the urine without appearing in the lymph and that this absorption was delayed if the drug was mixed with hypertonic saline solution which caused a large exudation of fluid into the peritoneal cavity.

B Absorption of bacteria

Russ (140) is of the opinion that bacteria are absorbed both by the lymphatic system and the blood and disappear from the blood earlier than from the lymphatic system.

Gucci (51), after injecting colon bacilli into the peritoneal cavity, recovered them from the thoracic duct in from ten to twenty minutes, and from the blood in from twenty to thirty minutes even when he canalized the thoracic duct to prevent contamination of the blood stream from that source. (Note: He could not of course be sure that he had thus blocked off all the lymphatic routes to the blood stream.) Bacteria appeared in the liver and spleen in from fifteen to thirty minutes. (The route to the spleen is not easily understood except either through the blood stream or through the peritoneum directly.) If he first produced peritonitis in his dogs by injecting turpentine one or two days before the injection of colon bacilli, he found that he obtained no growth either from the thoracic duct or from the blood stream although the organisms were still present in the peritoneal cavity. With mild peritonitis, produced with weaker emulsions of turpentine, he obtained sterile blood cultures but found bacteria in the thoracic ducts, which findings suggested a block of the routes into the blood.

Finucci (35) likewise found bacteria in both the portal vein and thoracic duct in less than five minutes after the injection.

These experiments indicate that absorption of bacteria and other particulate matter commonly occurs by way of the lymphatics, and of solutions or even large molecules by way of the blood stream. Whether the latter enter the lymphatics first is not known nor is the method of passage of any substance from the peritoneal cavity to the lymph or blood stream explained. It seems established that the inflamed peritoneum absorbs usually less actively than the uninfamed and that substances in solution are absorbed best when isotonic.

C Cellular reaction

A number of authors have studied the cellular reaction of the peritoneum to the injection of various substances. All are agreed that the polymorphonuclear leucocytes are normally present in very small numbers, the chief cells in the normal peritoneal fluid being large phagocytic mononuclear cells.

Dixon and Ruxford (35) estimated these cells in man to be in the neighborhood of 100 per c mm. Webb (191) and others have found that with the injection of almost any substance either in solution or suspension, there is a prompt development of an exudate containing a large proportion of polymorphonuclear leucocytes. Some of the authors have apparently not been aware of the importance of an accurate determination of the time after injection at which the examina-

tion is made, or have ignored the dilution factor of the fluid portion of the exudate

Seeley, Higgins, Mann, and Dixon (156), however, working with rats, determined the total number of peritoneal cells by counting the number of each type in each c.mm. and by weighing blotting paper before and after absorption of the total peritoneal fluid. Their total counts were: mononuclears, 18,000,000, eosinophiles, 3,000,000, basophiles, 1,000,000, and neutrophiles, 18,000. They injected amniotic fluid concentrate, Barger's colon bacilli and non-hemolytic streptococcus vaccine, and 2 per cent ricinoleate. After all injections, the polymorphonuclear leucocytes increased rapidly and reached a peak in from three to six hours. The mononuclears, on the other hand, increased gradually for a period of six days. The ricinoleate gave the most striking effect.

Similar work was done by Corwin (25, 26) who found that the cells increased from 1,800 to over 100,000 per c.mm. after injection of Barger's vaccine. Whereas the count per cubic millimeter after injection of sodium ricinoleate was only 40,000, the total amount of fluid was so much greater that a greater total number of cells was evoked by the ricinoleate than by Barger's vaccine.

Pons, Gannon, and Belk (125) found that while the leucocytes were pouring into the peritoneal cavity after the intraperitoneal injection of bacillus coli vaccines in $2\frac{1}{2}$ per cent gum tragacanth, there was a fall in the leucocytes of the peripheral blood. The same result was obtained with 5 per cent of aleuronat in gum tragacanth and the workers believe that this indicated a "withdrawal phenomenon."

D Peristaltic function

Namikawa (106) made certain observations on the peristaltic action of the gut. He found that almost any substance injected into the peritoneal cavity of animals slowed peristalsis, and electrical or mechanical stimulation of almost any part of the parietal peritoneum caused a reflex slowing of peristalsis, which could be prevented by cutting of the splanchnic nerves or by cutting of the cord at the second dorsal segment. After ligation of the blood vessels, stimulation of the splanchnic nerves produced no change in peristalsis, which suggested that the reflex passes through the sympathetics in the walls of the blood vessels.

Imanaga (70) placed glass windows in the abdominal walls of dogs and rabbits and observed peristalsis in the intestines following the intraperitoneal injection of certain irritating substances. When he injected Lugol's solution he found that the small gut went into spasm

wherever the solution touched it. The spasm was followed by a local slowing of the blood stream and local atony of the gut. When he produced local peritonitis by the injection of bacteria, he likewise found a local slowing of peristalsis, which could be corrected by the intravenous administration of saline solution or blood. Only in diffuse peritonitis was the gut affected extensively. Imanaga believes that the lowered blood pressure in diffuse peritonitis and the subsequent slowing of the blood stream cause an accumulation of acid in the intestinal wall which is responsible for atony of the gut and loss of peristalsis. When he examined the blood of the portal vein in animals with diffuse peritonitis, he found a lower pH, a lower sodium chloride content, and a marked lowering of the oxygen content.

III PHARMACOLOGY AND CHEMISTRY

A number of authors have studied the effect on distant parts of the body resulting from or following the injection of various materials into the peritoneal cavity.

A. Blood chemistry.

Hasama (58, 59) found that the blood sugar was increased in proportion to the degree of peritonitis, and that the adrenalin content of the blood and also of the adrenals was promptly elevated. On this basis, he believed that adrenalin was contra-indicated in peritonitis and that insulin should be used. Katsuragi (79, 79a), however, observed that the initial rise of adrenalin was followed by a fall, and this seemed to him to be a definite indication for the administration of adrenalin. Confirmatory evidence lay in the histological examination which revealed hemorrhages, fatty degeneration, and atrophy of the adrenal cells.

Hashimoto (60) found the same histological changes in the pancreas following peritonitis.

Tabanelli (178, 179) noted a fall in the cholesterol content of the blood, adrenals, and liver, but a rise in the cholesterol content of the spleen, in experimental animals suffering from peritonitis. In 33 patients with acute peritonitis, he recorded a fall in blood cholesterol, which continued progressively in those who died, but the cholesterol returned to normal in those who recovered.

Okada (114) produced peritonitis by perforating the small intestine of dogs just above the appendix by means of a hot iron. He then studied the blood chemistry and found an increase of nitrogen, increased viscosity, a fall in the chlorides, delayed clotting time, and a delayed sedimentation rate. All of the animals died from

peritonitis, and in the exudate he found large amounts of histamine picrate. He produced similar symptoms in animals by the injection of histamine and concluded that histamine is probably the important factor in death from peritonitis.

B Toxicity of the peritoneal exudate

Harmon and Harkins (55, 56, 57) produced peritonitis in dogs by leaving an open ileal loop within the cavity. They then filtered the exudate and injected it into other animals; the injection producing a fall in the blood pressure. The same result was obtained with filtrates of bacillus coli and clostridium welchii cultures, as well as non-protein extracts of these filtrates.

Scott and Wangenstein (154) injected large quantities of peritoneal exudate obtained from dogs with various kinds of strangulated loops of intestine. These exudates never caused a fall in the blood pressure unless there was a bacterial element within them.

Blalock (9) produced peritonitis by dividing the meso-appendix and opening the appendix in dogs. Some of his animals died quickly, some slowly, and some survived. In these animals he found that the subcutaneous administration of saline solution caused no increase in the peritoneal exudate, but the intravenous administration of this solution caused a marked increase of the peritoneal exudate with a lowering of the protein content of this fluid.

Bergh, Bowers, and Wangenstein (6) perforated the stomach in two series of dogs: one with, and one without, a full stomach. Of 29 dogs with an empty stomach, only 2 died. Of 30 dogs recently fed, 26 died. Of 17 dogs perforated immediately after the ingestion of food only 3 died. Of 16 dogs with a perforated duodenum 12 died and of 9 dogs with a perforated jejunum 4 died. Of 9 dogs with a perforated lower ileum all died. Of 7 dogs with a perforated cecum, 2 died. Of 8 dogs with a perforated rectum, 1 died. These findings confirm the observations of previous authors that the lower ileum is the most infective part of the gastro-intestinal tract.

C The reaction to inert substances

Norris and Davison (109) found extensive foreign body reaction in the peritoneum of 2 patients who had been operated upon previously and in whom liquid petrolatum had been instilled to prevent the formation of adhesions.

Several authors including Owen (116), Miller and Sayers (99, 100) and McCord (92) have observed the reaction of the peritoneum to certain powders and dusts. McCord and his collaborators attempted to measure the harmfulness of various

dusts in human lungs by their reaction in the peritoneal cavity of animals, considering those dusts which caused proliferation as the most harmful.

D Bile peritonitis

A number of authors have concentrated their attention on clinical and experimental observations in bile peritonitis. In their experimental work most of them produced peritonitis by the injection of bile or bile salts or by permitting bile from either the ducts or gall bladder to flow into the peritoneal cavity. All of these observers noted a resulting profuse exudation of fluid into the peritoneal cavity.

Harkins, Harmon and Hudson (54, 54a) estimated the exudation to be approximately a third of the blood volume and 60 per cent of the plasma volume, with resultant marked hemoconcentration. They believe that death is due to this, rather than to the activity of bacteria which appear later.

Moon and Morgan (104) examined the inflamed tissues microscopically and found marked capillary and venous engorgement of the serous surfaces and mucosa of the gastro-intestinal tract, kidneys, and lungs. They concluded that bile caused an increased permeability of the capillary walls.

Weinberg and Levenson (195) have maintained the view hitherto held, that such intense irritation of the peritoneum favored the passage of bacteria through the walls and they have recommended the use of appropriate sera.

Mentzer (98) in a review of 74 articles on the subject to which he adds a series of his own, concludes that human mortality depends almost entirely on whether the bile is infected or not. In his series of 24 cases, in which there had been a perforation of the gall bladder, 4 patients not operated upon died, but 14 of 20 who were operated upon recovered. He believes that bile peritonitis is much more dangerous in experimental animals than in man, because the bile of dogs contains more bile salts and bile acids than human bile and is much more apt to contain micro-organisms.

Trussler, Reeves and Martin (183) have pointed out that the bile of dogs frequently contains an anaerobic bacillus which closely resembles clostridium welchii but does not produce toxin. They and a number of other authors have experimented extensively on animals and have injected liver, either fresh or old, incubated or autoclaved, into the peritoneal cavity but these experiments do not seem to have any application to our knowledge of the disease as it occurs in man.

IV. BACTERIOLOGY

A number of authors have attempted bacteriological studies of the normal and inflamed peritoneal cavity, but most of them have not appreciated the difficulties encountered in such a study. For example, some have completely ignored the anaerobic bacteria and have not used the proper methods to reveal all of the bacteria which may be involved.

A. General

Roberts, Johnson, and Bruckner (141) maintain that in the vast majority of cases the peritoneal cavity is not sterile. They obtained positive cultures in 76 per cent of their cases, in which the peritoneum was opened in clean operations. However, these organisms were practically the same as those which they obtained from the deep layers of the skin before the peritoneal cavity was opened, which would seem to indicate their source. They were chiefly diphtheroids and staphylococci. Many of these organisms they found also in the laboratory air. Perhaps the most surprising result of their studies was that their cultures from frank infections of the peritoneal cavity did not yield a very much higher per cent of positive results than cultures from the non-inflamed cavity. Their results do not conform to the usual findings.

Friedrich and Weber (44) confirmed previous observations in demonstrating many intestinal organisms in stomachs afflicted with carcinoma, while stomachs or duodenums with benign ulcers were shown to have very few organisms and the cultures were often sterile. With these findings they properly correlate the higher incidence of peritonitis following resection of the stomach for carcinoma as compared with gastro-enterostomy for ulcer. The relative magnitude of these procedures may likewise play a part.

Clavel (21) and his associates likewise confirmed previous reports of a higher mortality in cases of perforated gastroduodenal ulcer which yielded a positive culture at the time of operation than in those yielding no growth. Sterile cultures were obtained in a series of 10 patients and 1 died from pneumonia. Of 8 patients yielding positive cultures, 4 died, 3 with peritonitis. Only colon bacilli and streptococci were obtained from these cultures. No enterococci, staphylococci, or anaerobes were found.

Cazzamali (18) studied the bacterial flora in 81 cases of peritonitis, 64 of which followed appendicitis. The organisms in the order of their frequency were the colon bacilli, non-hemolytic streptococci, and *Clostridium welchii*. In this respect he confirmed the work previously reported by Meleney, Harvey, and Jern (94). However,

he disagreed with them in that he did not believe that a reliable prognosis could be made on the basis of these cultures.

B. Unusual cases.

Several authors have reported cases of acute peritonitis which yielded the enterococcus in pure culture. In Mondor's (102) series of 5 cases, all were characterized by a sudden onset, an abrupt rise in temperature, diarrhea, a large amount of peritoneal fluid, distention, and toxemia. All but 1 patient died.

Decoux and Patoir (30) reported 8 similar cases, emphasizing diarrhea, usually preceded by eight to ten days of anorexia and malaise, as the outstanding symptom. All of the patients died.

Bertram and Bohne (7) presented 2 cases of acute diffuse peritonitis in which the infection seemed to arise in the upper small intestine, which was diffusely red and edematous or hemorrhagic. In both of these cases there had been a long period of anorexia and enteritis before the development of the classical signs of peritonitis.

Stefano (31) observed a case of an infant with pneumococcus peritonitis and pleurisy treated successfully by repeated aspiration and the injection of 15 per cent sodium taurocholate into both cavities.

Nagaoka (105) reported a fatal case which he considered primarily due to staphylococci. He was able to find only one similar case in the literature. The infection started with tonsillitis, and acute diffuse peritonitis followed. No focus was found. The appendix was normal. Staphylococci and a few streptococci were cultured from the pus, but were not more exactly classified, no colon bacilli or diplococci being present. The abdomen was drained and closed.

Cook (24) reported a case of peritonitis and one of tonsillitis in which the Friedländer bacillus was grown from each, and he believed that the two disorders were associated. He makes no mention, however, of other organisms found in the cultures.

Gerlach (47) reports 2 cases of gas-bacillus infection, one peritoneal and the other pleural. Although the infected cavities showed no gas, the respective abdominal and thoracic walls did. These findings seem to confirm the idea that gas-bacillus infection seldom forms gas in serous cavities. On the other hand, Rhodes (137) reported 2 cases, in one of which gas was produced in the abdominal cavity and in the wall of the intestine. No culture was made in the first case, the *Clostridium welchii* was found in the second. Rhodes makes no mention of other organisms, and it is not certain that they were pure Welch-

bacillus infections. Recently, however, the authors have observed a case of pure clostridium welchii peritonitis with free gas in the peritoneal cavity without perforation of the gut.

Plath (124) divided cases of gas peritonitis into three groups. First are those with collections of gas in and around the peritoneal cavity without signs of peritonitis. Second are those with spontaneous gas formation in the inflammatory process. Third are those with gas coming from perforation of the gastro intestinal tract.

Knobloch (86) reported the case of a girl with a blood agglutination titer of 1,000 for bacillus abortus. She developed a general peritoneal inflammation and was operated upon. A peculiar, thick, rather clear fibrinous exudate was found. The appendix was removed but showed only peritonitis. Knobloch called attention to an earlier article by Simpson and Frazer (161) who found epigastric pain in 16 per cent of their cases of bacillus abortus infection. Three of these cases were operated on for appendicitis by mistake.

Kondo (87) reports an interesting case of peritonitis which developed without a sudden violent onset. At operation, a bloody seropurulent fluid filled the peritoneal cavity and the peritoneum was inflamed. There were large retroperitoneal nodes continuous with inguinal buboes. The fluid was injected into apes and guinea pigs and revealed the virus of lymphogranuloma inguinale.

These unusual cases are of interest in demonstrating organisms capable of producing peritonitis, but it should be remembered that the common organisms are the colon bacilli, non hemolytic streptococci, and clostridium welchii.

C. Miscellaneous

Meleney Olpp Harvey and Jern (95) studied the synergy of the bacteria commonly found in peritoneal exudates. They showed that the minimal lethal dose of colon bacilli was less than that of the other two, and the virulence of colon bacilli could be enhanced by animal passage but not that of clostridium welchii or of the intestinal streptococci. Combinations of any two or all three of these organisms killed in very much smaller doses than pure cultures of any one of the three. The presence of the clostridium welchii did not indicate a graver prognosis than the others. These results seemed to indicate that the symbiosis or synergy of these organisms was important to their pathogenicity.

Biolato (8) starved a small series of guinea pigs for two or three days before an intraperitoneal inoculation with colon bacilli and found that they lived longer than another series allowed to eat

normally till the time of inoculation. If the starvation was extended to eight days however, the pigs showed less resistance.

Behrendt (5) was not able to produce peritonitis in animals by the intraperitoneal injection of bacteria unless his animals were in poor condition, and concluded that the localization of the infection might be due in part to this fact, at least in experimental animals.

David and Loring (28) attempted to produce peritonitis in dogs and rabbits by the injection into the peritoneal cavity of colon bacilli, streptococci, staphylococci and pneumococci along with their agar slants, or suspended in gum tragacanth. Most of the animals died rapidly of peritonitis. From the exudate not only the organisms injected but also Welch bacilli were uniformly cultivated.

V. CLINICAL ASPECTS

Many authors have reviewed the clinical aspects of peritonitis. One of the best reviews was by Flynn (39). He discussed the anatomical and physiological facts concerning the peritoneum, and the absorption of fluids and particulate matter. He divided peritonitis into the aseptic and infective types, the aseptic being due to mechanical injury or irritation by chemicals, blood, bile, urine, and digestive juices. This type usually subsides without serious consequences unless organisms are present in these fluids and an infective peritonitis follows. The infective type is comprised of primary and secondary infections. In the primary infections due to the pneumococcus and hemolytic streptococcus, the mortality is about 80 per cent if untreated and slightly lower if operation is performed. The secondary infections are usually due to gastro-intestinal diseases with a passage of bacteria either through a perforation or through the compromised wall of the intestine. The organism most commonly found is the colon bacillus. Inflammation of the peritoneum is always accompanied by two important processes, (1) the production of an exudate and (2) a paralysis of the intestinal muscle both of which limit the spread of infection. Flynn reviewed the well known symptoms and discussed the differential diagnosis. Prognosis depends principally upon the cause. When the peritonitis is due to perforation of the gut, prognosis depends upon the promptness with which that lesion is repaired.

A number of authors have considered the problem particularly from the standpoint of acute appendicitis. Most of these in general agree with the summary of Flynn given above.

Heyd (68) quoting Orr (115) states that the body can lose 40 per cent of its weight in fat, carbohydrate, and protein without death, but that the rapid loss of 10 per cent water is serious, and if it reaches from 20 to 22 per cent, it causes death. This must always be borne in mind in cases of peritonitis.

Bower (12) has continued his study of the mortality of acute appendicitis in the Philadelphia hospitals and has found some improvement as the result of his campaign for early operation and the avoidance of laxatives. He finds, however, that delay and laxatives are still the most important factors in the maintained high mortality.

Foss (40) found that the average duration of time between the onset of symptoms and the call of the doctor was seventy-four hours and the average time before admission, ninety-five hours. Only 7 per cent of the patients came in the hospital in the first twenty-four hours and 30 per cent in the first forty-eight hours. Those who died averaged four and a half days before surgical consultation and lived for an average of seven days after operation. Thus, the responsibility for the chief delay rests largely on the patients, but the doctor is at fault in permitting patients to go twenty-four hours more before sending them to the hospital. These twenty-four hours may be more important than the first forty-eight hours. In Foss' own series of 1,000 cases, the second 500 did not come into the hospital any earlier than the first 500 and the mortality was almost the same.

Schullinger (152) has recently reviewed the subject of acute appendicitis over a period of seventeen years at the Presbyterian Hospital in New York City. There were 2,653 cases of acute appendicitis with a total mortality of 5.8 per cent. One thousand, one hundred and seventy-five were cases of simple acute appendicitis with a mortality of 59 per cent. Six hundred and thirty cases of acute appendicitis with acute localized peritonitis showed a death rate of 19 per cent. Five hundred and seventy-one cases with abscess showed a mortality of 10.5 per cent. Among 329 cases of acute appendicitis with acute diffuse peritonitis, the fatal cases amounted to 17.02 per cent. Of 25 patients with acute appendicitis with acute general fibrinopurulent peritonitis, 88 per cent died. The mortality when judged in five-year periods during these years remained unchanged.

Over approximately the same period, McClure and Altmeier (91) reported a total death rate of 10.4 per cent, but found that their mortality figures when considered over five-year periods showed a steady decline. They studied the bacteriology of the peritoneal exudation and

found the colon bacillus to be by far the most frequent organism, occurring in 77 per cent of the cases, and the non-hemolytic streptococcus and the Welch bacillus next in order. They made no attempt to correlate the bacterial findings with the clinical course or mortality.

Giertz (48) has given a statistical review of cases of peritonitis in Sweden, with results which are similar to those reported in this country.

A number of authors have given particular attention to the study of postoperative peritonitis. Cutting (27) points out that postoperative peritonitis may be rapidly overwhelming or mild, and is difficult to diagnose. There is usually a latent period of from forty-eight to seventy-two hours, and pain may be minimal or absent. Intestinal activity stops and nausea and vomiting occur. Abdominal tenderness and rigidity are usually but not invariably present. Because of these facts and the difficulty of accurate diagnosis, the value of secondary operations is usually less than the value of primary operations for peritonitis, except when there has been a rupture of intestinal suture lines, massive hemorrhage, or bile leakage.

Such (175) has reviewed 6,421 surgical cases over a period of ten years and found a 1.36 per cent mortality from peritonitis. The abdomino-perineal operation for rectal carcinoma yielded the highest percentage of deaths from peritonitis (17 per cent). Following gastric resections for carcinoma 3.5 per cent of the patients died of peritonitis, 6.9 per cent dying after sleeve resections.

Shambaugh (158) found a mortality of 16 per cent from peritonitis among the fatalities which followed gastric surgery, 14 per cent following operations on the small bowel and 33 per cent following procedures on the large bowel. Some of the deaths attributed to pneumonia in his series may also have had the contributing factor of peritonitis.

VI. PROPHYLACTIC TREATMENT

A. Vaccines

The most active workers in this field have been Steinberg and Goldblatt (170, 171, 172) some of whose articles antedate the period covered by this report. Working with dogs, Steinberg (164, 165, 166, 167) reported in 1931 that they had succeeded in protecting almost two-thirds of their dogs against peritonitis produced by the administration of from three to five minimal lethal doses of colon bacilli suspended in gum tragacanth. They achieved this protection by giving four doses of bacillus-coli vaccine on the four consecutive days before the organisms were in-

bacillus infections. Recently, however, the authors have observed a case of pure clostridium welchii peritonitis with free gas in the peritoneal cavity without perforation of the gut.

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In spite of the interesting experimental work which has been done in the field of protection against peritonitis by vaccines, we do not believe that the extent of its value has been proved or disproved either experimentally or clinically. So many essential factors are to be considered including the type of vaccine employed, the dosage, the time and frequency of administration, and the manner in which the peritonitis is produced, that conclusive proof of any thesis is most difficult to obtain. It is not enough to say that one substance has protected better than another in two different series of animals in the dosages given. All practical dosages for each substance must be given in what has proved to be the best manner for each substance. In this respect, the experiments on bactragen are lacking. From the clinical side, any claim of lowered mortality due to any means must rest upon an adequate control series in which the means is not used. Such a series has not yet been reported. The use of vaccine holds promise, but should be placed on a more thorough experimental basis. In peritonitis we are dealing with organisms of low pathogenicity operating in an extensive cavity under variable physical conditions, and it is almost impossible to get two strictly parallel series of cases to compare.

B Amniotic fluid (amfetin).

Bovine amniotic fluid, which has been concentrated, has been recommended as a preventive of both postoperative adhesions and peritonitis when given intraperitoneally. These two claims seem hardly compatible, as adhesions are one of the chief sources of defense against the spread of peritonitis. It has been used clinically as a preventive of peritonitis by Johnson (73, 74, 75) and by Young and Marks, (196) with apparent success. The series reported is hardly large enough to permit definite conclusions. Johnson also attempted to demonstrate its effect on dogs, and stated that it made them less sick than did vaccine, and that it produced a similar outflow of polymorphonuclear leucocytes and, later, of macrophages in the peritoneal fluid.

Kimpton (83) and later Gefvert (46) described the beneficial effects which they saw from the use of amniotic-fluid concentrate as a preventive of adhesions. The latter reported that in dogs the postoperative adhesions were as numerous but less dense if amfetin were used at the time of operation. His clinical cases seemed to have a smoother postoperative course if it were used. He warns against its use in the presence of pus.

C Filtrates or antiviruses

Work with antiviruses has been based on Besredka's conceptions. Klein (85) recovered a

strain of the bacillus coli from the peritoneal cavity of a guinea pig in which peritonitis had been produced by ligation of a mesenteric vessel. From this strain he produced an antiviruses which he injected intraperitoneally into other guinea pigs to test its potency to protect against homologous organisms subsequently injected. He demonstrated some protection, but no more than he could obtain with antiviruses prepared from staphylococci or other organisms. He could show no protection in guinea pigs and rabbits if the antiviruses was given after the organisms, or after the production of peritonitis. The use of coli antiviruses in a few human beings showed no convincing evidence of benefit.

Montilli (103), working with filtrates to protect the peritoneum against homologous organisms and fecal soiling, obtained some degree of protection but this was never more than 20 minimal lethal doses.

Trinchera (182) demonstrated neither toxicity nor protection with filtrates.

Redi (136), in a few human cases of appendicitis with peritonitis, believed that he had seen benefit from the use of filtrate and anti-streptococcus serum.

Shimizu (159) used coli antiviruses in similar cases and believed it efficacious.

Oka (113) found that heated antiviruses was less toxic than the unheated, and evoked a more rapid leucocytosis and phagocytosis in the peritoneal fluid of guinea pigs, a reaction which was non-specific.

Ruggieri (143) observed that the intraperitoneal injection of staphylococcus antiviruses protected against subsequent lethal doses of homologous organisms, unless trypan blue were injected after the antiviruses, in which case there was no protection demonstrable. He believed that this was due to an alteration of the reticulo-endothelial system by the trypan blue, and argued that the protection, therefore, resided in the reticulo-endothelial system.

Reading the above reports together, it seems true that some protection against organisms injected into the peritoneal cavity can be evoked by the previous injection of filtrate or antiviruses, but this effect may be due to non-specific irritation of the peritoneum. None of the investigators has conducted experiments of sufficient scope to throw much light on the matter, nor has any of them controlled his experiments by a study of the possible effect of bacteriophage, which may be present in any unheated filtrate. No convincing evidence appears in these reports that the use of antiviruses clinically is justified.

jected. Fewer preliminary doses gave less protection, as did a vaccine prepared from a mixture of organisms. When, however, they produced peritonitis by a mixture of organisms instead of by colon bacilli alone, they could demonstrate little protection from either their bacillus coli vaccine or their mixed vaccine. On the basis of these experiments, they concluded that their bacillus-coli vaccine given in four successive daily injections was their best protecting agent. They thereupon gave it to human beings, injecting intraperitoneally four billion organisms in 50 c cm of saline solution, which had been divided into successive daily doses of 5, 10, 15, and 20 c cm. No humoral antibodies were found either in the serum or in the peritoneal fluid after these injections but it was shown that in dogs a great outpouring of polymorphonuclear leucocytes into the peritoneal cavity occurred after the protecting doses of vaccine had been given, and to these phagocytes the degree of protection obtained was attributed.

Later, Steinberg and Goldblatt (173) found that living colon bacilli suspended in a 1 per cent solution of gum tragacanth remained in the peritoneal cavity longer than when suspended in saline solution. They then conceived the idea of suspending their vaccine in gum tragacanth, and so evolved a protective emulsion which they called 'bactragen'. They attributed part of the virtue of this emulsion to the peculiar properties of the strain of colon bacilli which they used. With the emulsion of heat killed bacillus-coli vaccine in gum tragacanth they obtained better protection than they did with the same vaccine in saline solution or with gum tragacanth alone. With controls dying in all instances, they appeared to demonstrate protection against intraperitoneal injections of living colon bacilli suspended in gum tragacanth, against a mixture of pyocyanous bacilli, streptococci fecalis, and clostridia welchii given intraperitoneally, and against peritonitis evoked by injury to the cecum of dogs.

Steinberg and Kobacker (174) protected dogs with bactragen and then produced peritonitis in them and in unprotected controls. The protected dogs showed less drop in their blood pressure, less cardiac arrhythmia, slower pulse as well as less evidence of myocardial damage than did the controls.

Following these experiments preparations of bactragen were used in human beings preliminary to operations on the intestine in which postoperative peritonitis was feared. In 1934 Goldblatt (50) reported that 400 human beings had received injections of bactragen at the hands

of various surgeons, with only 3 deaths from postoperative peritonitis occurring in the series. At the same time, Jones (77) reported 2 deaths with bloody peritoneal fluid after using the injections and said that he had thereafter avoided its use. In 1936, Steinberg (168) reported 391 cases in which bactragen had been used, without any instance of postoperative peritonitis, and Potter and Collier (126) from the University of Michigan Clinic reported 79 cases with 11 deaths, but only 1 attributable to peritonitis. More recently Collier and Ransom (23) have reported the use of bactragen without any harmful effect in 300 cases. With the belief that the desired reaction comes in three hours, in the later cases they introduced it at the time of operation, instead of by preliminary injection.

Concurrently and basing his work largely on experiments by Herrmann (66) in 1923, Bagen had developed a vaccine made from colon bacilli and streptococci which was used chiefly at the Mayo Clinic, where it was given as one of several pre-operative measures before resection of the intestine. Dixon and Bagen reported in 1935 that this vaccine had been used in 1,500 patients, and that since its introduction the mortality from postoperative peritonitis had dropped 66 per cent. Rankin and Bagen (134) previously published encouraging results in a smaller series but subsequently Rankin (133) reported that he had abandoned this method because he found that he had further reduced his operative mortality in the last 130 patients by other pre-operative measures. His former vaccine series of cases numbered 527. This does not mean with certainty that vaccine would not have permitted him to reduce the mortality still further. Herrmann (67) in 1935 was still using vaccine with an impressive reduction in mortality.

It seems clear from the work cited that some protection can be obtained in laboratory animals against peritonitis produced experimentally. The mechanism of this protection has not been clearly demonstrated. Steinberg (169) has argued that, because polymorphonuclear leucocytes appear in the peritoneal fluid in response to the protective injection and can be shown to ingest bacteria, they are the probable agents of protection. He calls this protection 'hyperleucocytic preimmunity'. Rebeck (135) found that bacillus-coli vaccine gave peritoneal protection when injected intraperitoneally or intrapleurally in rabbits but not when injected subcutaneously. The part played by macrophages, the reticulo-endothelial system, and the humoral elements has not been sufficiently studied.

tion of saline solution, and in no case was there a prolonged fecal fistula

There is a difference of opinion with regard to drainage. Kennedy (82) drains most cases and uses a coffer dam instead of tubes. Flynn (39) drains only when there is a localized abscess. Foss (40) believes that any drain is a dangerous procedure. Molnar (101) tried to settle the question of drainage by studying the exudate in cases of peritonitis following appendicitis. He stained the cells with Seyderhelm's supravital stain and based the criterion of drainage on the number of living as against the number of injured pus cells. Irrespective of the character of the pus or the number or nature of the contained bacteria, he suggested drainage when the number of injured cells exceeded 50 per cent.

Buchbinder (14, 15) and his co-workers tried to bring light to bear upon the question of drainage by an interesting series of experiments on dogs. They produced peritonitis by making an open loop of lower ileum, 40 cm. in length, and re-establishing the continuity of the bowel by end-to-end anastomosis. Usually it took about twenty-four hours of contamination from such a loop to produce a serious spreading peritonitis. Generally only the central half of the peritoneum became involved, while the pelvis and diaphragm remained free. Of 42 animals so operated on, 9 died from a leaky anastomosis. Of the other 33, 14 survived and 19 died. Five of the deaths were due to abscess and 14 to general peritonitis. No drains were used in this series, but in a second series of 20 cases in which the same procedure was used, 2 drains were placed in each case, and all of these dogs died. In 5 other animals the lower ileum was perforated and drains were applied in 4 of them. All of these dogs died. Buchbinder concluded from these experiments that in a spreading peritonitis the focus should be removed, the exudate should be sucked out, and the peritoneum should be closed. Drainage of the abdominal wall is advisable, but drainage of the abdominal cavity should be avoided.

B. General treatment

McClure and Altemeier (91), Heyd (68), and others have urged the pre-operative administration of fluids. Most authors have stressed the importance of giving nothing by mouth after operation but restoring the water and electrolytes by parenteral administration. A few favor frequent transfusions of blood. Fowler's position is generally accepted and gastric suction through a nasal tube is rapidly gaining favor. Morphine is advocated by most authors. Flynn (39) believes that pituitrin and physostigmine are to be avoid-

ed, but Potter (127) reported a small series of cases in which he emphasized the importance of ileus and methods directed toward its control. Over a ten-year period he found a mortality of 35 per cent in acute diffuse peritonitis following appendicitis. About 75 per cent of these fatal cases presented ileus as a major factor. In the last 25 cases the mortality was only 12 per cent and there was no death resulting from ileus. Potter considered that 1 c cm. of pitressin given every two to four hours after operation was of considerable value in preventing postoperative ileus.

Opinions with regard to conservative treatment for peritonitis as contrasted with prompt operative treatment still differ radically, but there is some indication that the conditions to which these treatments should be applied are becoming more clarified. Alton Ochsner (112) supports the conservative treatment advocated by his uncle, A. J. Ochsner. He points out that not the time in hours, but the condition of the patient when first seen, is the important factor. Operation should not be done if the bacteriological process is in the stage of localizing. Some cases should be operated on immediately on admission even if it is four or five days after onset of the symptoms, while others should be treated conservatively if they appear to be localizing within twelve hours of onset. Ochsner points out that conservative treatment requires constant supervision and careful surgical judgment. The principles are to limit the spread and favor localization, to put the gastro-intestinal tract at rest by giving nothing by mouth, and to aspirate the stomach and duodenum. Fluids should be given by rectum, vein, or clysis. Fowler's position should be used for gravity drainage. Morphine acts not only as a general sedative but as a tonic to the bowel. Oxygen should be given if respirations are depressed. The questions that come to mind in considering this problem are (1) How can the surgeon or the general practitioner tell whether the process is advancing or localizing? (2) How can he be sure that the measures employed will limit the spread and favor localization?

Coller and Potter (22) present the very low death rate of 9.3 per cent in cases of ruptured appendix with spreading peritonitis. These cases were treated by the Ochsner method. In the discussion of Coller's paper, Guerry reported 94 gangrenous ruptured appendices with diffuse peritonitis which were operated on immediately and carried a mortality of 10.64 per cent. In 135 similar cases treated by the Ochsner method there was a death rate of only 1.4 per cent.

D Bacteriophage

In animals, Rice (118) found that a mixture of streptococcus, staphylococcus, and coli bacteriophages gave no protection against peritonitis produced by feces or injury to the intestine in dogs. In mice, Jera, Harvey, and Meloney (72) obtained protection with intraperitoneal injections of bacillus coli bacteriophage against bacillus coli peritonitis, amounting to 25 times the dose of organisms that killed controls. This protection could be obtained not only if the bacteriophage was injected before the bacteria, but also when injected at the same time or up to three and a half hours afterward. Control animals usually died in five hours. Bacillus coli filtrate did not similarly save the animals. Bacteriophage given subcutaneously had no effect if given after the organisms were injected. From the peritoneal cavities of mice that had been protected by intraperitoneal injections of bacteriophage, it could be recovered for several days afterward.

The evidence that bacteriophage can be used in the therapy of peritonitis, judging from the above reports is slight but encouraging. It is possible that it may be useful in prevention but only in cases in which the predominating organisms happen to be susceptible to the bacteriophage injected. There is little or no evidence that commercial preparations of single or combined bacteriophages have proved their value in the prevention or cure of peritonitis.

E Miscellaneous

Tabaneh (178, 179) obtained slight protection against colonic bacilli by injecting colloidal silver and other chemicals intraperitoneally into guinea pigs. Siciliani (160) found little protection from 10 per cent sodium nucleinate or 10 per cent glucose.

Seeley (155) suggested treating antigens with sodium ricinoleate to lessen their toxicity but reported no experimental work of his own in support. Schaffenberg and Harms (146) failed to demonstrate any protection against pneumococci by the use of various vaccines. Shaludo (157) stated that he obtained slight protection against the bacillus coli by the oral administration of coli vaccine and grape sugar more than from vaccine alone. None of this work suggests that non-specific substances can give significant degrees of protection against peritonitis.

Smith (162), working with rabbits, found that he could protect them against peritonitis due to a strain of hemolytic streptococci by a previous injection of a commercial preparation of streptococcus antitoxin globulins. There was little protection if the antitoxin was given after injection

of the organisms. Diphtheria antitoxin failed to give protection, which is evidence that the protection was, in part at least, specific.

Carneiro (17), hoping that the natural immunity thought to reside in the peritoneum could be transmitted, made extracts of peritoneal tissue and injected them into 30 human beings with various infections of staphylococcus origin. He noted some alterations in the recipients' white cells, and believed that all the recipients but one had benefited from the treatment.

Rademaker (132) injected defibrinated sheep's blood into the peritoneal cavity of guinea pigs together with living colon bacilli. He found that the presence of the blood did not add to the virulence of the organisms.

VII ACTIVE TREATMENT

A Operative treatment

Most authors believe in prompt operation in most cases of peritonitis with removal of the focus of infection with a minimum of trauma. In the case of appendicitis some surgeons for example Foss (40), recommend that the appendix should always be removed, while others advise not removing it in the case of abscess or general peritonitis if it cannot be excised without the danger of spreading the infection. On the other hand Kennedy (52) considers it important to remove the source of infection and break down adhesions in order to relieve bowel obstruction and drain distant abscesses. He believes that operation should be done in cases of appendicitis within an hour after the patient is seen and that the watchful waiting of the physiological surgeon for a quiescent stage in the peritonitis abdomen due to a perforated appendix has been a disastrous blunder.

McClure and Altemeier (91) found that the lowest mortality in appendicitis occurred in the cases operated on through a McBurney's incision and that spinal anesthesia was accompanied by a lower death rate than ether. Faehnd (37), likewise draws particular attention to the use of McBurney's incision and spinal anesthesia instead of the right rectus incision and general anesthesia. He estimated that his mortality was cut down one third by these procedures alone although his two series we e not run in parallel. Flynn (62) likewise, prefers local anesthesia.

Jones (76) reported a series of cases of perforated appendix with diffuse peritonitis with a mortality of only 14 per cent and explained his good results as being due to a cecostomy through the appendix stump. He used the cecostomy tube for the drainage of the cecum and for the instilla-

therapy for peritonitis. The sera have been given intraperitoneally at the time of operation, subcutaneously, intramuscularly, intravenously, and, by Matyas (90), directly into the subperitoneal tissues and site of incision into the abdominal wall. The dosage has varied from about 50 c cm to more than 300 c cm given the day of operation and on subsequent days. Frequently it has been given intravenously while the patient was under anesthesia, for there is evidence that anaphylactic reactions may thus be avoided. Serum reactions have been frequent, usually not serious, but apparently leading to death in one or two instances of the 2,500 or more cases in which serum has been used.

In view of the heterogeneous nature of the reports, it must be admitted that the value of serum in the treatment of peritonitis is not yet proved, although it is significant, we believe, that the reports favoring its use outnumber the adverse reports by almost six to one. Most of the surgeons who favor its use present statistics to show that since the introduction of serum their mortality from peritonitis has fallen. Coming from one or two clinics, statistics of this sort might not be impressive, but coming as these do from many reputable sources, it is impossible to ignore them. Men who have reported a drop in mortality rate observed in their own clinics since the introduction of serum include Banfi, Canavero (16), and Pellegrini (119, 120, 121) in Italy, Dick (33), Gundel and Suessbrich (52), Kunz, Krenn and Reichl (88), Nobel (108), Riemann (139), Spitzer (163), and Stoeger (176) in Germany, and Prochnow (130, 131) in Hungary. In France, Vincent (188, 189) favoring chiefly a bacillus-coli serum, and Weinberg (193, 194) favoring a complicated mixture, are enthusiastic. Priestley and McCormack (129) at the Mayo Clinic report a lowered mortality in a small group of cases. In the United States and England, the sera have apparently been little used.

The most convincing of the articles in favor of serum to our minds has been that of Riemann (139). He reports 368 cases of peritonitis in which either coli serum or a combined "peritonitis serum" was used during the period from 1931 to 1933. He saw no difference in results from the two types of sera. Of the 368 cases of peritonitis, 244 followed appendicitis with a 4.5 per cent mortality, and 124 followed other lesions with a 20.9 per cent mortality. In previous three-year periods without the use of serum the mortality had been from 21.7 per cent to 22.5 per cent for peritonitis following appendicitis and from 37.7 per cent to 38.4 per cent for peritonitis following

other causes. The number of cases in each three-year period had been nearly constant, and the late cases had been always relatively few, as Riemann served an urban community. He was impressed by benefits of the serum which do not appear directly in the mortality statistics, such as the early return of peristalsis. He never used over 100 c cm of serum for a case. There is, on the other hand, the report of Kapel (78) who also used coli serum with or without anti-anaerobe serum in 330 cases of postappendicular peritonitis, selected his sickest patients, and saw no benefit with regard to the mortality either in comparison with his earlier results without serum or with the results in neighboring clinics.

In addition to the above reports, there have been others which tell of the use of sera with varying degrees of enthusiasm. The authors include Aievoli (1), Balogh (3), Gohrbandt (49), Jacobovici (69), Katzenstein and Zimmer (81), Matyas (90), Nossen (110), Perrando (122), Pozzi (128), Schmiedt (149), Schneider (150, 151), Schulze (153), Klages (84), Trifkovic (181), Van Heerde (186), Verner (187), and Zukschwerdt (197). Mentioned in almost all reports are the surgeons' impressions of the unexpectedly smooth course of the serum-treated patients, the early return of bowel function, and lack of postoperative complications. Six men, Borchard (11), Kapel (78), Santi (144), Schmechel (148), Urech (185), and Vorschuetz (190), have run counter to the general trend, and stated that they have seen no benefit from serum. Two of these, Kapel (78) (Copenhagen) and Urech (185) (Switzerland), have formed their opinions only after a fairly extensive clinical trial. Santi (144) in Italy has had the interesting opportunity to try a serum in 14 cases in which, for one reason or another, operation was not attempted. Nine of the 14 patients died. It is not fair to say from this that serum may not be a useful adjunct to operation.

Very meager experimental work has been reported by Perrando (122), Geller (45), and Chiari and Kunz (19), each of whom tested the effect of sera given to guinea pigs or rabbits, which also received anaerobes or feces intraperitoneally. They all demonstrated some protection, but their series of animals were small.

In summary, concerning the serum therapy of peritonitis, we may say that while it is difficult to evaluate the reports of its clinical use, they are encouraging, and the subject deserves to be investigated further experimentally. Before the sera are employed clinically, they should be proved to be effective in animals against the organisms that they are designed to combat.

Davis (29) went over his cases of death following appendicitis with the express purpose of attempting to determine whether or not conservative therapy would have modified his mortality, and concluded that his death rate could have been lowered not over 1 per cent by this means. He believes that he would have lost a number of cases which he thinks were saved by operation. He prefers limiting conservative treatment to fulminating cases if any. Cutting (27) believes that Ochsner's method of treatment is usually much better for postoperative peritonitis than operative treatment, with morphine Fowler's position, frequent gastric lavage or continuous gastric suction, nothing by mouth, and parenteral fluids, from 4 to 5 liters a day. When the acute stage is passed, residual abscesses should be sought, but they should not be approached surgically until they have become well localized. Pelvic abscesses frequently may be opened through the rectum. Lumbar abscesses are usually easy of approach, while subphrenic collections are usually the most difficult. Cutting emphasizes the importance of x rays in the diagnosis of subphrenic abscess and believes that operation should not be unduly delayed when diagnosis has been made.

In general it may be stated that we have come to a better understanding of the profound physiological disturbances that go on in the presence of peritonitis. The fundamental requirements are (1) the reestablishment of a normal fluid and electrolyte balance before or as soon after operation as possible, (2) the removal of the distributing focus of bacterial propagation, and (3) the restoration of the peristaltic function of the gastro intestinal tract.

C Serum

Over 50 articles have appeared in the medical literature concerning the treatment of peritonitis with various sera. Almost all of these reports are concerned with the clinical results in human cases. Very little is presented in the way of experimental work. It is impossible to tabulate these articles and, for several reasons, difficult to attempt even to evaluate them. Most of the writers obviously are not discussing comparable series. Some of the sera have been given prophylactically, while some have been employed only curatively and the indications for use in each instance have varied. Various kinds of sera have been used, they have been prepared by several different laboratories and against differing organisms or their products, and administered singly or in combination, in ranging doses, and by different routes.

The sera used have been obtained from horses as a rule, but in at least one instance cattle have

been employed to avoid reactions which might occur in patients sensitized to horse serum. The following antigens have been employed (1) bacillus coli filtrate, (2) the toxins of clostridium welchii or of combined anaerobes, (3) a combination of the two just cited, (4) enterococci, usually added to colon bacilli and the anaerobes, (5) bacterial bodies as well as toxins of colon bacilli together with the anaerobes (6) a number of other organisms such as the bacillus fusiformis, bacillus funduliformis, staphylococcus, and intestinal streptococcus which have produced a serum to which is added polyvalent anti-gangrene serum and anti coli serum.

There is rationale for the use of at least some of these antigens in the attempt to develop a serum for use in peritonitis. Many investigators have reported that the organisms commonly found in the intestinal tract are present in the peritoneal cavity in large numbers in most cases of acute diffuse peritonitis following intestinal lesions. Of these, the bacillus coli is most commonly found, with clostridium welchii and the intestinal non hemolytic streptococcus next in order of incidence and probable significance. At least two of these, the bacillus coli and clostridium welchii can produce toxins. It is reasonable to suppose that these organisms or their products add to the morbidity in peritonitis, and that potent antisera against them would form a valuable therapeutic aid. However, it is not clear, except in the case of the anaerobes, that such potent sera can be produced commercially. It is also not known that a serum produced against one strain of bacillus coli, for example, will be effective against other strains. In work shortly to be reported, we have tested in mice one of the German made commercial bacillus coli antisera that has been used clinically abroad against a strain of relatively virulent colon bacilli, and we could show no protection from it. In collaboration with one of the commercial firms in this country we earlier attempted to produce in horses a potent bacillus coli antiserum but with little success. We did develop, however in the laboratory a serum in rabbits which protected mice against many lethal doses of the homologous bacillus coli if given before the organisms were injected.

The first use of bacillus coli serum clinically has been attributed to Guthrie (53), but he used serum together with coli vaccine only in cases which underwent no operation and in which the diagnosis was doubtful. Weinberg (192) and later Katzenstein (80) in 1927 appear to be the chief instigators of the present effort at sero-

Breitner (13) used the same technique on a series of 29 patients, 10 of whom had typical bacterial purulent peritonitis. Two of these died, one a child practically moribund on admission. Eight of the 10 patients had a perforation of the appendix with foul pus in the peritoneum, and were very sick. In 1 of the other patients, there was a gangrenous appendix about to perforate, and in the other an acute appendicitis with purulent exudate free in the peritoneum. The bacterial flora in these cases was not determined.

Breitner quotes from Eppinger, who has shown that in cases of peritonitis there is a capillary stasis caused by the bacterial toxins. This results in a puddling of blood in the splanchnic area and a deficient return flow of blood to the heart. There is a corresponding decrease of the minute volume of the cardiac output. He believes that the histamine which is probably produced through the irradiation of the intestinal loops by the ultraviolet light, opens up the arteriovenous anastomoses. The pressure in the portal vein rises, as does the minute volume of the cardiac output.

Nicole (107) used Havlicek's technique in 44 cases of peritonitis of which 8 were due to perforated ulcer, 14 to perforated appendices, and 22 to acute appendices. All the patients recovered, except 2 with perforated ulcer. He was impressed by the favorable postoperative course and the shorter stay in the hospital, and although there were many complications, none was very serious.

Paschoud (118) reported a number of cases in which he used the ultraviolet light as recommended by Havlicek. His series included 1 case of hemolytic streptococcus peritonitis in which the appendix was removed, the stomach and the small and large gut were punctured in five places to let out the gas, and ultraviolet light was applied to a coil of ileum. The operation was done under local anesthesia. The patient got up from the operating table, walked to the elevator, and that evening walked around the room, and promptly made an uneventful recovery. Paschoud also had 2 cases of appendiceal abscess which he operated upon and closed without drainage. When he operated later to remove the appendices he was surprised to find no adhesions. Everything appeared normal, including the appendices. He agreed with the explanation given by Havlicek, that in some way or other the stagnation of blood in the splanchnic area was prevented.

Nowotny (111) likewise reported the use of ultraviolet light. He treated 62 cases according to Havlicek's technique, except that he drained, used general anesthesia at times, and did not allow the patients to get up from the operating

table as Havlicek did. He also gave alkaloids if necessary. He was not able to show any lowering of the mortality of the treated cases as compared with the untreated group, but at post mortem in his fatalities there was usually evidence of diminished or absent peritonitis. This would seem to indicate the importance of following Havlicek's technique in strict detail.

On the other hand, the experience of Clairmont (20) did not bear out the claims of Havlicek. He does not say how many cases he treated nor does he give the details of his technique. He did not see any striking improvement in the postoperative course, and his patients developed residual abscesses and emboli. He believes that his experience neither confirmed nor refuted the experience of Havlicek and suggested further scientific study of the problem.

Domanig (36) used the lamp in 197 cases, some clean and some infected, withholding it in the same number to establish controls. He saw no benefit of any kind from the lamp.

Friedrich (43) made some experimental studies on the effect of ultraviolet light in animals. In normal animals in which the stomach or intestinal loops were everted, he demonstrated the widening of blood vessels, especially the veins, thus slowing the circulation. In the treated animals, this effect was much diminished after two minutes or more of exposure to the ultraviolet light. He also found that when indigo carmine was given intraperitoneally it was absorbed much better in the animals treated with ultraviolet light than in the untreated, as judged by the amount excreted in the urine. After irradiation of the entire small intestine of his animals, they developed enormous appetites.

These results of Havlicek are astonishing and if they can be confirmed are truly significant. Clinical data can be obtained only by a large series of cases in the hands of a number of careful observers. It would seem that the theories with regard to the mode of action of this narrow band of ultraviolet light would lend themselves to experimental proof, and it is hoped that Havlicek and others will carry on their investigations in this field.

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D Bacteriophage

Bacteriophage obtained from the bacillus coli has been used by Jacobs (71), Freedman (42), and by Ruddell Sicks and Loomis (142) in human cases of peritonitis. It is not possible to say from the reports what benefit was derived. Blanco (10) states that he has obtained good results from it. Tsouloukidzé (184) gives an interesting report of 47 cases of intestinal perforation occurring in patients with typhoid fever. Of these, 27 were treated by operation without bacteriophage with a mortality of 89 per cent. The other 20 received operation plus a mixture of bacteriophages and presented a mortality of 35 per cent, a striking drop even in so small a series. The reports on the whole are encouraging, but convincing evidence awaits a large series of cases with a lowered mortality and a shortened period of convalescence, in which a potent bacteriophage has been used against susceptible organisms.

E Ultraviolet light

A great deal of interest has been aroused by the report of Hans Havlicek (61, 62, 63) who in 1932 reported the treatment of 108 cases of peritonitis following appendicitis without a single death. He referred to a review of peritonitis by Karschner which revealed a mortality of 47.7 per cent in 11,000 cases and of 38.5 per cent in the cases resulting from appendicitis alone. Havlicek uses the Laporophoslampe with a Wood's filter which gives essentially a monochromatic light permitting line 366 to come through. This light is luminescent and the visible rays and those which produce erythema and conjunctivitis are filtered out. The lamp hangs from the ceiling and can be directed on the operative field without interfering with the main source of luminous light or with the sterile technique. In cases of peritonitis following appendicitis the appendix is removed first. The cecum is then replaced in the peritoneal cavity and a loop of the lower ileum is delivered. When possible the omentum is also brought out. Then by the raising of the operating table and lowering of the lamp to within 35 cm. of the exposed loop the intestine, mesentery, and the omentum are exposed first on one side and then on the other, to the beams of the light. The duration of exposure is not constant. In mild cases five minutes seemed to be enough. In severe cases ten minutes, and when the prognosis would ordinarily be extremely bad these tissues were occasionally exposed for twenty five minutes. In a number of the severe cases also other portions of the intestine including the transverse colon were brought out. After exposure the loops were restored to the peritoneal cavity and the abdomen

was always closed without drainage although in badly infected cases the abdominal wall was usually drained for from three to four days. Havlicek emphasized the importance of using local anesthesia. He let all but the very sick patients get up from the operating table and walk to their rooms with no apparent bad results. He was impressed also by the absence of pain in the postoperative course. Furthermore, he never found in any of these cases any complications such as residual abscesses in the pelvis, the subphrenic space, or the liver or in any instance pneumonia, embolism, thrombosis, or other complication.

What the method of action of the ultraviolet light is, Havlicek cannot say for certain but various experiments on the placental circulation seem to indicate that the ultraviolet light penetrates through the blood vessel walls and acts upon the blood itself. This blood mixing with the blood coming from the rest of the intestine and the spleen enters the liver. Ellinger, of the Fredericks Institute believes that histamine is formed by the action of the ultraviolet light on histidine and that the histamine thus formed in some way restores the splanchnic circulation to normal. He believes that the ultraviolet light may also act upon the endothelial cells and stimulate the production of opsonin or complement, and thus increase the immune substances.

In later articles Havlicek (64, 65) presents further experiments concerning the effect of the ultraviolet light and claims to have demonstrated that the arterial system is connected with the venous system not only by the regular capillaries but also by blood vessels which are opened or shut by authority cells, Quellsellen. These cells are activated by substances normally present in the body and by certain drugs. He believes that the ultraviolet light releases or forms certain products in the mesentery and omentum which open these special arteriovenous connections. This speeds up the whole splanchnic circulation and thus overcomes the venous stasis which is one of the chief causes of thrombus formation. He believes that morphine and products of the posterior lobe of the pituitary gland act to close these capillaries and are thus contra indicated postoperatively. The capillaries are also blocked under chloroform or ether anesthesia. The rapid flow of the portal blood enables it to become rapidly detoxified.

A number of authors have tried to confirm Havlicek's results. Three of their articles give unqualified confirmation. Although they did not have his perfect score the authors were much impressed by the favorable results.

Breitner (13) used the same technique on a series of 29 patients, 10 of whom had typical bacterial purulent peritonitis. Two of these died, one a child practically moribund on admission. Eight of the 10 patients had a perforation of the appendix with foul pus in the peritoneum, and were very sick. In 1 of the other patients, there was a gangrenous appendix about to perforate, and in the other an acute appendicitis with purulent exudate free in the peritoneum. The bacterial flora in these cases was not determined.

Breitner quotes from Eppinger, who has shown that in cases of peritonitis there is a capillary stasis caused by the bacterial toxins. This results in a puddling of blood in the splanchnic area and a deficient return flow of blood to the heart. There is a corresponding decrease of the minute volume of the cardiac output. He believes that the histamine which is probably produced through the irradiation of the intestinal loops by the ultraviolet light, opens up the arteriovenous anastomoses. The pressure in the portal vein rises, as does the minute volume of the cardiac output.

Nicole (107) used Havlicek's technique in 44 cases of peritonitis of which 8 were due to perforated ulcer, 14 to perforated appendices, and 22 to acute appendices. All the patients recovered, except 2 with perforated ulcer. He was impressed by the favorable postoperative course and the shorter stay in the hospital, and although there were many complications, none was very serious.

Paschoud (118) reported a number of cases in which he used the ultraviolet light as recommended by Havlicek. His series included 1 case of hemolytic streptococcus peritonitis in which the appendix was removed, the stomach and the small and large gut were punctured in five places to let out the gas, and ultraviolet light was applied to a coil of ileum. The operation was done under local anesthesia. The patient got up from the operating table, walked to the elevator, and that evening walked around the room, and promptly made an uneventful recovery. Paschoud also had 2 cases of appendiceal abscess which he operated upon and closed without drainage. When he operated later to remove the appendices he was surprised to find no adhesions. Everything appeared normal, including the appendices. He agreed with the explanation given by Havlicek, that in some way or other the stagnation of blood in the splanchnic area was prevented.

Nowotny (111) likewise reported the use of ultraviolet light. He treated 62 cases according to Havlicek's technique, except that he drained, used general anesthesia at times, and did not allow the patients to get up from the operating

table as Havlicek did. He also gave alkaloids if necessary. He was not able to show any lowering of the mortality of the treated cases as compared with the untreated group, but at post mortem in his fatalities there was usually evidence of diminished or absent peritonitis. This would seem to indicate the importance of following Havlicek's technique in strict detail.

On the other hand, the experience of Clairmont (20) did not bear out the claims of Havlicek. He does not say how many cases he treated nor does he give the details of his technique. He did not see any striking improvement in the postoperative course, and his patients developed residual abscesses and emboli. He believes that his experience neither confirmed nor refuted the experience of Havlicek and suggested further scientific study of the problem.

Domanig (36) used the lamp in 197 cases, some clean and some infected, withholding it in the same number to establish controls. He saw no benefit of any kind from the lamp.

Friedrich (43) made some experimental studies on the effect of ultraviolet light in animals. In normal animals in which the stomach or intestinal loops were everted, he demonstrated the widening of blood vessels, especially the veins, thus slowing the circulation. In the treated animals, this effect was much diminished after two minutes or more of exposure to the ultraviolet light. He also found that when indigo carmine was given intraperitoneally it was absorbed much better in the animals treated with ultraviolet light than in the untreated, as judged by the amount excreted in the urine. After irradiation of the entire small intestine of his animals, they developed enormous appetites.

These results of Havlicek are astonishing and if they can be confirmed are truly significant. Clinical data can be obtained only by a large series of cases in the hands of a number of careful observers. It would seem that the theories with regard to the mode of action of this narrow band of ultraviolet light would lend themselves to experimental proof, and it is hoped that Havlicek and others will carry on their investigations in this field.

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SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Hertel E. Lymphadenitis Mesenterialis (Lymphadenitis mesenterialis) *Beitr z Klin Chir*, 1937 166 231

The mesenteric glands prevent all kinds of specific inflammations from the simple hyperplasia of the sinus catarrh to purulent fusion and purulent perforation peritonitis. In first place stands the lymphangitis of the appendix which is not essentially very different from lymphangitis mesenterialis and which is frequently confused with pseudappendicitis with negative histological symptoms. The author states that a true diagnosis could be obtained if the vermiform process had been subjected to a searching examination. Because of the fact that macroscopic changes at the outlet of the organ are usually absent, it is to be assumed that lymphadenitis is caused mainly by the action of swallowed bacteria which reach the glands through the intestinal wall and there produce an allergic inflammatory condition.

The most prominent clinical symptoms are the peritoneal irritations of different intensity according to the seat and degree of the glandular infection, only the simple hyperplasia produced no peritoneal symptoms. The abdominal symptoms are not as distinct as in appendicitis; the pain may center also in the left side. In the simple cases there is an absence of the board-like hardness of the abdominal muscles. Blumberg pain (pain in the ileocecal region or the Rovsing symptom) resistance and vomiting. There remains only the deep palpation pain centering about the navel. In the disease of the mesentery proper there is a feeling of pressure, a sense of repletion and pain in the region of the stomach. In the more serious cases, there is a high temperature from 38 to 39 degrees, and a high leucocyte count (20,000) in contrast to the relatively insignificant local symptoms. The condition resembles influenza or infectious gastro-intestinal diseases. The differential diagnosis from appendicitis remains difficult; consequently one should beware of postponing urgent action. In spite of the fact that the mesentery lymphadenitis appears always secondary, it presents itself with its clinical symptoms as an independent complete picture in which sometimes the source of infection is veiled or is often hard to locate. The name lymphadenitis mesenterialis has the same justification as lymphadenitis coli when after the reduction of laryngeal infection the inflammation of the cervical region is most prominent. Lymphadenitis mesenterialis is frequently the first concrete revelation of inflammation in the form of a mild or symptomless appendicitis, typhilitis or enteritis. It is possible to develop cholecystitis or pancreas disease over the plexus celiacus through retrograde transport or propagated thrombolympangitis in lymphadenitis mesenterialis of the

vermiform region. There are relapses even when the source of infection is healed so that for example it is possible that pain will remain after the removal of the chronically afflicted appendix.

In regard to the possibility of secondary independent disease, abscess and perforation or induration and adhesion, it is safe to accept Borchard's current stand that in ileocecal lymphadenitis the diseased regional glands should always be removed along with the appendix and never without it. It is noteworthy that after these steps have been taken the decline of fever takes place only gradually.

(SIEVERS) CLARENCE C. REED M.D.

Adams W. E. and Olney M. B. Mesenteric lymphadenitis and the Acute Abdomen. *Ann Surg* 1918, 107 359

The authors give the case histories of 8 proved and 5 probable cases of mesenteric lymphadenitis simulating an acute lesion of the abdomen. Of these there was only 1 case of tuberculous mesenteric adenitis. There was 1 death following operation.

Clinically two of the most outstanding features of this condition are the colicky nature of the abdominal distress and the marked tendency toward recurrent attacks. There is often a history of a recent or concurrent upper respiratory infection. All of the authors' patients were between the ages of one year and fourteen years. The child aged one year died following operation. In the cases of one half of the patients the pain remained generalized over the abdomen and in only 2 was it localized in the right lower quadrant of the abdomen. Nausea and vomiting occurred in most cases, and diarrhea was present in 5.

The white cell count is frequently elevated out of proportion to the patient's temperature. It was not uncommon to find a white cell count of 6 or 10,000 though only 4 of the patients had a temperature of 101.3 degrees.

A definite pre-operative diagnosis is difficult if not impossible. The history of many previous attacks and the colicky nature of the abdominal pain, together with the lack in many cases of localizing signs or symptoms are helpful in suggesting a definite diagnosis. Mesenteric lymphadenitis is almost always confused with acute appendicitis and it must also be differentiated from pylonephritis, intussusception and Meckel's diverticulum.

Exploratory laparotomy is indicated in most cases in which the diagnosis is uncertain. In some cases it is possible to observe the patient for several hours before a definite type of treatment is chosen. The restoration of fluid and the mineral balance and the limitation of intake by mouth to a minimum may be carried out while a decision to operate is being made.

A rapid subsidence of abdominal symptoms and pathological findings is very helpful in the determi-

nation of the true nature of the condition. The period of observation need not be longer than two or three hours, but if the symptoms and findings make delay seem hazardous, exploration should be carried out at once. The danger accompanying exploratory laparotomy and appendectomy is little compared to that associated with complications arising from a mistaken diagnosis. When exploration is undertaken, removal of the appendix is a routine procedure. Lymph nodes are removed only for diagnosis.

EARL O. LATIMER, M.D.

Irwin, F. G. Acute Iliac Adenitis: A Report of 18 Cases. *Arch Surg*, 1938, 36: 561

Acute iliac adenitis is not as uncommon as the lack of its recognition would indicate. It occurs in children and is characterized by a history of cutaneous infection on the lower extremity, and the appearance of a tender, fixed mass in the iliac fossa, accompanied by pain, fever, leucocytosis, and spasm of the psoas muscle. Irwin presents a review of the literature, reports a series of 18 cases, and gives a comprehensive description of this clinical entity.

The vagueness of the symptoms of acute iliac adenitis at the onset, and the resemblance of the symptoms to those of appendicitis, hip-joint disease, osteomyelitis of the head of the femur, and abscess of the psoas muscle account for the infrequency of correct diagnosis.

The disease is more common in boys than in girls, undoubtedly because trauma and infection are more common in boys. Pain in the iliac fossa, the lower part of the abdomen, or the groin, is the predominant symptom. A mass occupying the iliac fossa is always present, and can often be felt through the rectum.

Conservative treatment is recommended at first. Operative treatment consists of extraperitoneal approach to the mass, followed by incision and drainage. Irwin operated upon 10 of his 18 patients, all of whom recovered. Five were cured by conservative treatment and, because of a mistaken diagnosis, 3 were operated upon for acute appendicitis, but these also recovered.

EARL GARSIDE, M.D.

GASTRO-INTESTINAL TRACT

Maddock, W. G.: Nutritional Disturbances Associated with Diseases of the Stomach and Duodenum. *Am J Surg*, 1938, 39: 12

The altered physiology and biochemistry associated with lesions of the stomach and duodenum are as important as the etiology, symptoms, pathology, and operative correction of the condition. Nutritional disturbances may cause vitamin, mineral, protein, carbohydrate, or fat deficiencies, either individually or in combination. Caloric requirements cannot always be met adequately, although the parenteral administration of glucose is a distinct aid in the prevention of ketosis. However, the substances that can be administered in quantities by the intravenous route, namely, water, glucose, and sodium chloride, are inadequate to maintain the

health of the patient for more than two or three weeks. Vitamins and proteins are also needed and these requirements are often a considerable problem in the cases of patients who are seriously ill. Many of them have had a pre-operative period of malnutrition for months, and a long-standing deficiency is present. The purpose of this study is to review briefly the vitamin and protein deficiencies as they may affect the surgical patient with lesions of the stomach and duodenum.

Vitamin-A deficiency has been reported in patients with diarrhea secondary to gastrocolic fistula. Such a deficiency may be determined by the "keratinization test" of Blackfan and Wolbach, in which conjunctival scrapings show abnormal cornified epithelial cells. Carotene and fish oils meet this deficiency.

Vitamin-B deficiency occurs in patients with pyloric stenosis, gastric carcinoma, and polyps, it may occur secondarily in patients upon whom gastroenterostomy has been performed, and may follow persistent vomiting after surgery on the biliary tract. It can readily be corrected by the administration of Vitamins B₁ and B₂.

The early signs of Vitamin-C deficiency may be determined from the urinary excretion, body store, and blood plasma, or from serum concentrations of cevitamic acid. A promising test consists in the production of venous stasis in an arm for fifteen minutes with a blood-pressure cuff at 50 mm of mercury, and then the counting of the number of petechial hemorrhages in a skin area of 60 mm in diameter in the antecubital fossa. The test is positive in the presence of more than 8 petechiæ, 5 or fewer constitute a negative reaction.

Vitamin-D deficiency may occur with celiac disease, sprue, external biliary fistula, and chronic jaundice. The value of viosterol in decreasing the hemorrhagic tendency in patients has been demonstrated by many investigators.

In the absence of gross bleeding, patients with gastric or duodenal ulcers usually show little change from the normal. On the other hand, patients with gastric carcinoma show a secondary anemia due to continual oozing from the carcinomatous surface. Pernicious anemias have followed partial resection for carcinoma, ulcer, and syphilis of the stomach, as well as gastro-enterostomy for peptic ulcer. The treatment varies with the type of anemia. The secondary anemias respond well to large doses of iron. For pernicious and other forms of hyperchromatic anemia large doses of liver are indicated.

The effects of protein deficiency are more frequently seen in surgical patients with malnutrition from disturbed gastro-intestinal function than in patients with malnutrition due to vitamin deficiencies. Prolonged low protein ingestion results in low plasma proteins, and nutritional edema is a rather common sequel. The edema may, however, be secondary to profuse surgical drainage, sepsis, loss of serum protein by massive hemorrhage, retention of base due to disturbed renal function, and

the administration of excessive amounts of water and salt. This water retention is of major significance because patients who are seriously ill and present malnutrition or sepsis have been shown to develop retention routinely if the water requirements supplied intravenously in the form of saline solution and sodium chloride were not needed. Jones and Eaton have shown that this retention may occur even when serum protein levels are approximately normal. Many investigators have shown clinically and experimentally that in the presence of low serum proteins the salt is essential for edema. The first thought of the surgeon on finding edema in the sick surgical patient who has been receiving fluids parenterally should be: What are the serum protein values and how much sodium chloride has been given? It is unnecessary and even harmful to the sick patient to administer more than a few grams of the sodium chloride daily when the plasma chlorides and carbon dioxide combining power are normal and when no abnormal loss of sodium chloride is occurring. Five per cent glucose in water may be used as it rarely produces edema.

As a prophylactic measure in patients with long standing severe malnutrition several transfusions prior to the operation and the passage of a Jutte tube down through the gastro enterostomy stoma to the distal jejunum, during the operation have been advised. This procedure permits nourishment early in the postoperative period. Eggs and yeast may be utilized as a source of protein and milk and cod liver oil will supply essential vitamins until the patient can tolerate solid foods.

SAMUEL J. FOGELSON M.D.

Portnoy B. and Wilkinson J. F. Vitamin C Deficiency in Peptic Ulceration and Hematemesis.
Brit. Med. J. 1953 1: 554

The authors present experimental evidence to support their belief that gastroduodenal ulceration is apt to occur in animals in a state of Vitamin C deficiency. The importance of Vitamin C in the reproductive processes of animals has recently been emphasized and a deficiency of this vitamin has been shown to be a potent factor in delayed wound healing. We now know that early prescurvitic or subclinical states of scurvy may occur quite frequently in patients who have received conservative dietetic treatment for peptic ulceration. The authors' study was based upon 107 subjects who were divided into 4 groups.

Group 1 consisted of 26 members of a departmental staff and medical students.

Group 2 consisted of 25 miscellaneous patients excluding those with gastric or renal disease.

Group 3 included 23 patients who were suffering from proved peptic ulceration without hematemesis and all patients on special diets of the Hurst No. 1 and No. 2 types.

Group 4 contained 31 patients who had been admitted to the hospital for severe hematemesis secondary to peptic ulceration. The diets of these

patients had been very poor and they were put on special diets, usually the Hurst No. 1 type on admission.

The methods of investigation for Vitamin C deficiency included:

1. Determination of the daily urinary excretion of ascorbic acid.
2. The ascorbic acid saturation test.
3. The plasma ascorbic acid determinations.
4. Oral ascorbic acid tolerance tests.
5. Intravenous ascorbic acid tolerance tests.
6. Intradermal tests.

Upon comparing the results of these methods and using the results to estimate the degree of saturation in normal subjects and in patients with peptic ulcer and hematemesis, the authors found that the daily urinary excretion of ascorbic acid is a fair index of Vitamin C deficiency. A value of about 13 mgm. may be considered as being the average minimal excretion.

All patients in Groups 3 and 4 gave figures below 13 mgm. The saturation test for tissue Vitamin C was found by these investigators to be more accurate than the estimation which was made of the total ascorbic acid excreted in the urine. However, unsaturation is not an abnormal state and this may occur in normal individuals unless they are on a diet which contains an excess of Vitamin C. Therefore a normal individual may rapidly become unsaturated. The intravenous ascorbic acid tolerance test following the intravenous administration of 1000 mgm. of ascorbic acid showed that normal individuals would excrete from 660 to 985 mgm. of ascorbic acid within twenty-four hours, while patients with peptic ulceration and hematemesis would excrete from 72 to 458 mgm. This conclusion may however not apply to patients with severe renal damage. The intradermal test of Vitamin C deficiency gave results which agreed very closely with those obtained in the other tests in that decolorization lasting longer than ten minutes indicated Vitamin C deficiency.

All 6 methods showed that patients with peptic ulceration and hematemesis suffered from severe Vitamin C deficiency. The most severe degrees of this deficiency were found in patients with hematemesis.

SAMUEL J. FOGELSON M.D.

Bourne G. Vitamin C Deficiency in Peptic Ulceration Estimated by a Capillary Resistance Test.
Brit. Med. J. 1953 1: 560

Harris and his collaborators demonstrated that there was a low Vitamin C output in the urine of 74 hospital patients with gastric or duodenal ulcer which were studied. This finding was confirmed by Archer and Graham as well as by Trout. The latter reports that half of a glass of orange juice caused no discomfort in most patients with peptic ulcer and further points out that theoretically 40 liters of orange juice would be required to furnish the equivalent of the acid contained in 100 c.c.m. of gastric juice at a pH of 2.7.

Svent-Gyorgyi discovered that the problem of the relation of Vitamin C to capillary fragility requires consideration of another factor called Vitamin P, which of course, is closely associated with Vitamin C and appears to be responsible for the condition of the capillary walls. The essayist has, however, made no attempt to differentiate between the effect of Vitamin C and that of the Svent-Gyorgyi factor, although he realizes that the latter may ultimately prove to be solely responsible for the changes in capillary fragility.

This investigation was carried out with the objective of determining whether a deficiency of anti-scorbic vitamin in peptic ulcer as described by the above authors is sufficient to cause a lowering of the capillary resistance. The method used was that described by Gothlin. In this test the upper arm is compressed at a standard pressure so as to increase the pressure within the capillaries and then the number of ruptured capillaries is determined after a given time by counting the number of petechiae visible within a given area of skin. A circle 60 mm in diameter was marked out in the angle of the elbow. The petechiae occurring within this area after compression of the upper arm at a standard pressure of 50 mm of mercury were counted and the number recorded. In a total of 22 control patients there were 40 petechiae or an average of 1.82. Twenty-eight patients with gastric ulcer showed 199 petechiae or an average of 7.10. Fourteen ulcer patients had 103 petechiae or an average of 7.36. In addition capillary resistance tests were done on 23 patients suffering from various other diseases. They showed an average of 2.86 petechiae.

The author therefore concludes that, clinically, hospital patients on a dietary regimen for gastric and duodenal ulcer showed a degree of capillary fragility greater than that of normal subjects or patients suffering from other diseases. The histories of these patients indicates that the degree of capillary fragility is related to inadequacy of the diet with regard to anti-scorbutic vitamin, but no evidence was obtained that the development of peptic ulcer was conditioned by deficiency of anti-scorbutic vitamin in the diet.

SAMUEL J. FOGELSON, M.D.

Eagle, P. C., and Gillman, J.: The Incidence of Peptic Ulcer in the South African Bantu. *South African J. M. Sc.*, 1938, 3, 1.

This study contrasts the incidence of peptic ulcer in Europeans, Eurafricans and Bantus at the Government Mortuary and the Johannesburg General Hospital. The material studied consisted of 15,296 autopsies. There were 4,773 Europeans, 43 of whom died from ulcer, an incidence of .901 per cent, there were 9,472 Bantus, 15 of whom died from ulcer, an incidence of .137 per cent, and there were 1,051 Eurafricans, 5 of whom died from ulcer, an incidence of .476 per cent.

Examination of these results shows that the incidence of peptic ulcer is highest in the Europeans and lowest in the Bantus. It is about three and a

half times more common in the Eurafrican than in the Bantu and seven times more frequent in the European than in the Bantu, the European is apparently twice as susceptible to peptic ulcer as the Eurafrican. From this data it would be easy to conclude that the hill tribes are immune to peptic ulcer because of their diet and that the urbanized Indians are now more susceptible to ulcer.

Although diet may be important, the psychological factors may also play a causative rôle in the production of peptic ulcer. The isolation of the Himalayan tribes and their relatively settled life and peaceful living, as contrasted with the precarious existence and constant mental strain present in inhabitants of overcrowded cities, may explain to some extent the difference in the incidence of ulcer of these two distinct communities.

SAMUEL J. FOGELSON, M.D.

Boyd, L. J., and Schlachman, M.: The Meulengracht Treatment of Bleeding Peptic Ulcer. *Rev Gastroenterol*, 1938, 5, 43.

The authors report the cases of 30 patients with severe hemorrhage from peptic ulcer, who were admitted to the Metropolitan Hospital, New York. These patients were treated by the orthodox management of partial or complete starvation, followed by an ulcer diet, transfusion, venoclysis, and morphine. Six of them died.

Fifteen patients who were subsequently admitted, and who were treated by the Meulengracht method, have survived. They have had no recurrence of hemorrhage or of perforation. The unanimous opinion of the workers who have employed this method of treatment is that the newer Meulengracht regimen reduces the mortality rate to between 1 and 2 per cent. The mortality rate under the old Meulengracht regimen had been from 7 to 15 per cent.

Meulengracht has abandoned the old Luebe principle of inanition and under-nutrition in the treatment of patients with bleeding ulcer, for the following reasons:

1 The more carefully the old inanition regimen is carried out, the weaker the patient becomes and the more the mortality is increased.

2 Patients with ulcer often remain ambulatory after severe melena, without appreciating the significance of "tarry stools" and without a change of diet, and their course is very favorable.

3 Since posthemorrhagic shock and posthemorrhagic anemia form the most urgent indications for treatment following massive hemorrhage, the value of inanition, limited fluids, salts, calories, and vitamins is questionable.

4 It is doubtful whether emptiness of the stomach and the presence of unneutralized acid is suitable, either for hemostasis or for healing.

5 It is scarcely conceivable that an insufficient diet will promote regenerative processes.

These reasons must be considered further because there are early and late deaths resulting from hemorrhage in peptic ulcer. A small number of

patients have erosion of a major vessel and succumb within thirty six hours. Any medical program for patients in this group would be more or less unsatisfactory. On the other hand a considerable number of patients die from *exhaustio virium* some time after the occurrence of hemorrhage. The subjective improvement of patients on the Meulengracht regimen is startling. They welcome liberal feeding and seem psychologically impelled to eat to regain their strength. From an objective standpoint patients are now out of bed within two weeks instead of from five to six weeks. Nurses are impressed with the rapid improvement in the condition of their patients and cooperate unusually well in carrying out the details of this regimen.

The authors do not conclude that any of their 25 patients were saved by the Meulengracht treatment but their accumulated observations have been sufficient to convince them that the gastro intestinal canal will tolerate a much greater latitude than was suspected prior to the liberal program of Meulengracht. This evidence indicates that the normal blood picture is more rapidly restored under a liberal regimen and that greater liberality in feeding ought to characterize the posthemorrhage episode.

SAMUEL J. FOGELSON, M.D.

Haerem S. Dack, G. M. and Wilson H. Acute Intestinal Obstruction. I. The Role of Bacteria in Closed Jejunal Loops. *Surgery* 1938 3 333

A study was made of the bacteriology and toxicity of the contents of obstructed bowel segments in 8 dogs in an effort to isolate and identify the many organisms which are found in a closed intestinal loop. The clostridium welchii and bacillus coli were found to be the predominating organisms. The clostridium welchii organisms were found capable of the production of a potent toxin *in vitro* in most instances. These studies did not show any definite evidence of clostridium welchii toxin in the loop fluid nor did they substantiate views that the toxemia of acute intestinal obstruction is due to the specific toxin of bacillus welchii.

RICHARD J. BENNETT, JR., M.D.

Haerem S. Dack, G. M. and Dragstedt L. P. Acute Intestinal Obstruction. II. The Permeability of Obstructed Bowel Segments of Dogs to Clostridium Botulinum Toxin. *Surgery* 1938 3 339

The dog is known to be quite resistant to the oral administration of botulinum toxin, which is one of the most potent bacterial toxins and one which can be detected in very small quantities. Cultures of the clostridium botulinum were grown and then used in several experiments.

The clostridium botulinum did not pass through the normal intestinal wall of dogs when fed in quantities of less than 50 c.c. The introduction of larger quantities occasionally resulted in the absorption of small amounts. When clostridium botulinum

toxin is injected intraperitoneally in large doses it is readily absorbed and may be demonstrated in the blood stream within two hours after injection and in time it is lethal for the dog.

Acute experiments on intestinal obstruction made in dogs under varying conditions showed absorption of clostridium botulinum toxin in the obstructed loops even when placed there in small quantities. The distention of the isolated loop was roentgenographed. There seems to be some correlation between demonstration of the toxin in the blood stream and distention of the loop. Gross necrosis of the distended loop did not always occur where there was absorption but devitalization of the bowel segment certainly facilitated the appearance of toxin in the blood stream. RICHARD J. BENNETT, JR., M.D.

Cuthrie D. and Brown M. J. Diverticula of the Proximal Intestine. Duodenum and Jejunum. *Am. J. Surg.* 1938 39 123

In this article the authors have dealt first with a consideration of the pathology and anatomy incidence, diagnosis and treatment of diverticula of the duodenum. Routine fluoroscopic examination should include the upright, supine and the modified Trendelenburg positions. Two cases one of which had been reported previously, are reviewed. Both patients were females, one fifty and the other sixty nine years of age, and both survived operation.

Under the heading of 'Diverticula of the Jejunum' the authors discuss the history, incidence, pathology, pathogenesis, symptomatology, diagnosis and treatment of the condition. They also present a summary of 4 cases reported previously accompanied by 9 photographs and roentgenograms.

The article is summarized as follows:

The literature on diverticula of the duodenum and jejunum has been reviewed.

The difficulties in diagnosis of the diverticula are shown by the summary of the cases included here. The experiences of the authors are similar to those of others who have dealt with this problem as indicated by their writings.

The principal factors at work in the production of diverticula are anatomical defects of the bowel wall at the points of entrance of the blood vessel and increased intra intestinal pressures.

The treatment of diverticula of the small intestine is surgical but the location and extent of the lesions govern the type of surgery to be used in individual cases.

CARL R. STEINKE, M.D.

Bartlett M. K. and Lowell W. H. Acute Postoperative Duodenal Fistula. *New England J. Med.* 1935 218 537

In a review of the literature from 1865 to 1931 a total of 130 reported cases of postoperative duodenal fistula were found. Excluding those cases which occurred more than three months after operation and which therefore cannot be classified as acute as well as those cases in which sufficient data

were unavailable, the total amounts to 116. Twelve cases are added from the records of the Massachusetts General Hospital (Boston) for the past twenty years.

Two general types of duodenal fistula were seen: the lateral type, in which the opening is in the duodenal wall but the continuity of the gastro-intestinal tract remains intact, and the end type, in which the fistula results from leakage from the closed duodenal stump following gastric resection or pathological occlusion. The latter type is much less common. Certain fundamental factors, such as trauma, sepsis, and improper healing, lead to the production of duodenal fistula. Chemical changes, too, are brought about in patients with duodenal fistula: blood chlorides fall, sodium bicarbonate is lost, the carbon-dioxide combining power of the blood is increased, dehydration occurs, the non-protein nitrogen of the blood rises, and the serum protein falls.

The diagnosis of postoperative duodenal fistula usually presents no great difficulty. The treatment is divided into two phases: adequate local care of the wound, and systemic treatment to offset the effects of the loss of the duodenal contents. Several methods of local treatment are discussed. The general treatment consists of an adequate supply of fluid, salt, and glucose and, if possible, the establishment of an adequate means of introducing substances into the gastro-intestinal tract below the fistula. The authors suggest the passage of a small nasal tube through the stomach and into the duodenum, far enough to be effective, or the introduction of a tube through the fistulous tract into the duodenum. If these simpler methods are not effective, a jejunostomy must be done. The 12 cases studied in the hospital are reported.

HAROLD OCHSNER, M D

Allen, C. I.: Primary Carcinoma of the Duodenum. With a Report of 11 Cases. *Am J Surg*, 1938, 39: 89.

Eleven cases of primary carcinoma of the duodenum were diagnosed in ten years at the Henry Ford Hospital, Detroit, Michigan, 6 of them have been reported previously. During this time 154,673 patients were seen, therefore this disease occurred in approximately 1 of every 14,000 patients admitted.

Brief histories with a comment on each are given. There are 4 illustrations and 1 chart. A summary comment on the 11 cases includes the location of the tumors, symptoms, examination, diagnosis, operation, and treatment. There were 8 different pre-operative diagnoses made.

Of the 11 cases, 3 were rightly considered inoperable. The remaining 8 were operated upon. In 2 the tumor was not found at operation, and cholecystectomies were performed. In 5 cases the masses involving the duodenum and adjacent structures were palpated, but the condition was considered inoperable because of metastasis to the liver in 4 and to the pancreas in 1.

Only 3 palliative operations were performed, an ileostomy, a gastro-enterostomy, and a cholecystenterostomy.

Only 1 radical operation was done in which a resection of a portion of the duodenum with transplantation of the common duct into the stomach and a posterior gastro-enterostomy were carried out. The patient was still living at the time of the report.

Ten of the tumors proved to be cylindrical-cell adenocarcinomas and 1 a medullary carcinoma as diagnosed by Hartman. Post-mortem examination was made in 8 cases, 2 others terminated fatally.

CONCLUSIONS

1. The diagnosis of carcinoma of the duodenum is extremely difficult.

2. The syndrome of the author's cases was not diagnostic of anything other than a disease of the gastro-intestinal tract.

3. The presence of occult blood in the stool not otherwise accounted for should make one suspicious of a duodenal tumor. This finding is probably the most valuable aid in the differentiation of benign from malignant disease. Disregard of it will lead to mistaken diagnoses.

4. X-ray filling defects in the duodenum are helpful in diagnosis, but are often not seen. The development of a special technique for examination of the duodenum seems essential.

5. The operative treatment of duodenal tumors is an involved and difficult procedure. It is deserving of further development. CARL R. STEINKE, M D

Fowler, R. H.: The Rare Incidence of Acute Appendicitis Resulting from External Trauma. *Ann Surg*, 1938, 107: 529.

The correct evaluation of external trauma in acute appendicitis is important. Traumatic influences should be judged only on a very critical basis. This is purely a medical problem from the legal viewpoint. Court decisions rest entirely upon expert testimony, and the surgeon who appears as a witness should do so for the purpose of throwing light upon a subject of which the court is ignorant. It is conceded that the appendix is not immune to injury, but the majority of cases reported as traumatic appendicitis are misnamed.

In the evaluation of traumatic influence, five essentials must be correlated and united: (1) the history, (2) the force, (3) the mechanism, (4) the length of time elapsed following the accident, the development of the disease and operation, and (5) the pathology demonstrated at operation.

Appendicitis has been held a compensable injury by the courts, based upon its origin, aggravation, and whether it is the result of violence, either direct or indirect. Verdicts in general, regardless of whether the cases are the result of aggravation or origination, are equally divided between plaintiff and defendant. In cases of direct injury, the courts have favored the plaintiff in the ratio of five to one. In cases of indirect injury verdicts in favor of the plaintiff are two to one.

The following conclusions were drawn

Appendicitis is a disease and not an accident. It cannot be produced by trauma alone. The primary cause of the disease is bacterial infection occurring in a vestigial organ possessing low vital resistance and susceptible to destructive changes on slight provocation. This provocation is furnished by slight abrasions of its mucous membrane from the presence of hardened fecal matter and especially by circulatory disturbances.

The question of the correct evaluation of trauma rests largely upon (1) whether the patient has had previous attacks of appendicitis, (2) the character of the force, (3) the time element, (4) the bridging of symptoms from accident to operation, (5) the pathological findings at operation, and (6) the final microscopic diagnosis.

There are no proofs that chronic appendicitis can be attributed to trauma. If operation is refused, or if delayed and late operation reveals only chronic microscopic pathology, the case should not be accepted as one of traumatic origin. Lastly, if the attack following the accident subsides and recurs later, the injury should not be held responsible for the second exacerbation. JOHN W. NOZUM, M.D.

Mathewson, C. Jr. Inflammatory Strictures of the Rectum Associated with Venereal Lymphogranuloma. *J. Am. Med. Ass.* 1938, 110, 709.

Frei first suggested that certain types of benign rectal stricture might be manifestations of venereal lymphogranuloma. Certainly all benign strictures could not be of this type, but many of the etiological theories suggested in the past cannot account for the condition. Diseases previously considered as factors were syphilis, tuberculosis, amebic dysentery, gonorrhea, and chancroid. Careful consideration of these factors readily convinces one that these diseases cannot account for most of the inflammatory strictures. The frequent finding of a positive Frei test in patients suffering with inflammatory stricture of the rectum is strong evidence that venereal lymphogranuloma is the real causative factor in the majority of cases.

The clinical picture of the disease in the rectum is characteristic. There is a history of bloody mucous discharge from the rectum, pruritus and tenesmus with intermittent periods of constipation and obstruction. The stricture is usually one of three distinct types. The first type consists of an annular diaphragm which is usually single but may be multiple. The second type of stricture is funnel shaped and feels granular on palpation. A third type may be very extensive and involve the entire bowel below the rectosigmoid junction.

Papillomas of the mucous membrane below the site of the stricture are almost invariably present in all three types. The early stages of the rectal lesion are seldom recognized. Patients suffering from this condition are often operated on for hemorrhoids, polyps, fissures and fistulas. The earliest symptom is usually pruritus associated with mucous discharge.

Proctoscopic examination shows aouting of the mucous membrane with edema and swelling and considerable hyperemia. The infiltration may occur in a localized segment or may appear concurrently at several different levels. Ulceration may occur below the site of stricture.

The majority of investigators have come to the conclusion that the causative factor in the production of benign stricture is to be found in the disturbance of the lymph flow. The exact nature of this disturbance is not known. Chronic lymph stasis may lead to nutritional disturbance which in turn may lead to ulceration, proliferation of the connective tissue, elephantiasis and, finally shrinkage and stricture.

Although specific changes may take place after invasion of the tissues with the virus of venereal lymphogranuloma, Mathewson has been unable to recognize them histologically as such except in the lymphatics.

Seventy eight patients with benign rectal stricture in the San Francisco Hospital were studied. Forty of these patients were seen before the introduction of the Frei test, but a critical analysis of these cases in the light of present knowledge would bring all but 4 of them into the category of lymphogranuloma. The remaining 38 patients studied with the Frei test gave positive reactions.

The treatment of inflammatory stricture of the rectum is in general unsatisfactory. The result of drug therapy has been discouraging. Treatment by x-ray and radium has been of little value. The use of Frei antigen may at least check the advance of the disease. The lower bowel should be kept clean. Perirectal abscesses if present should be drained. Fistulous tracts should be excised and radical surgical procedures should be used only if obstruction occurs. Repeated dilatation of the strictures leads to unnecessary trauma and is therefore not advisable.

EARL GARSTEN, M.D.

LIVER GALL BLADDER, PANCREAS AND SPLEEN

Brendolan, G. Six Clinical Cases of Biliary Peritonitis. (Contributo di sei casi clinici allo studio di coleperitonite). *Arch. Ital. di mal. dell'appar. digerente*, 1938, 7, 49.

Biliary peritonitis was first described by Bartholin in 1897 who observed a peritoneal effusion of about 10 liters of bile following a trauma, but an accurate description was given by Clairmont and Isaberey in 1911.

From his own personal experiences and in agreement with the majority of the investigators, Brendolan believes that biliary peritonitis may be produced by filtration through the wall of the gall bladder especially in those cases in which the wall is thin and distended. The transudation does not always take place through the entire wall but occurs only in certain places at which the tissue has undergone profound alterations. According to Brendolan these

pathogenetic mechanisms are of practical importance to the surgeon, who should not prolong the operation unnecessarily while trying to find a perforation, which usually cannot be demonstrated.

In discussing the cause of biliary peritonitis, Brendolan believes that cholecystitis and cholelithiasis, especially if of the occluding type, predispose greatly to its development. The increased permeability is probably due to the inflammatory irritation of the gall-bladder wall which becomes gradually thinner.

Anatomicopathologically, a biliary peritonitis is characterized by the transudation of bile into the peritoneal cavity. Large quantities, of 10 or more liters usually accumulate. The fluid tends to accumulate in the more dependent portions of the cavity, especially in the iliac fossa. The transudate has the physical and chemical properties of bile mixed with pancreatic ferments.

Bacteriological examination reveals frequently the presence of pathogenic organisms, especially the bacillus coli, and less frequently the enterococcus, streptococcus, and staphylococcus. The peritoneum does not present any special pathological features. The gall bladder is usually found to be markedly enlarged, distended, and sometimes thickened and edematous. Multiple necrotic areas may be recognized. In a large percentage of the cases it contains multiple stones, but in other cases stones are absent and the condition probably develops as the result of a long-standing cholecystitis. Ulcerations and perforations have almost never been reported.

The necrosis may be extensive and may involve the entire thickness of the gall-bladder wall although the mucous membrane is usually attacked. Associated with the necrotic changes are acute and chronic inflammatory processes accompanied by the presence of stones.

There is usually a serobilious imbibition of the gall-bladder wall and various vascular changes may also be present.

Symptomatically the disease begins much like a moderately severe biliary colic. The patient begins to vomit and complains of pain in the right hypochondriac region which becomes gradually more intense and tends to spread over the entire abdomen. The course is less stormy than in cases of acute generalized peritonitis. The temperature is moderately elevated. Examination of the abdomen reveals at most a slight muscular rigidity.

The diagnosis is not always easy and the condition should be differentiated from appendicitis, perforated peptic ulcer, intestinal obstruction, pancreatic fat necrosis, and renal colic.

The prognosis is favorable in treated cases. Treatment is always surgical and the operation should be performed without delay. The author recommends a cholecystectomy rather than a cholecystectomy, followed by a thorough drainage of the biliary passages and of the subhepatic space in order to prevent the development of a subdiaphragmatic abscess.

RICHARD E. SOMMA, M.D.

Mixer, C. G., and Hermanson, L.: A Critical Evaluation of Cholangiography. *Am J Surg*, 1938, 39: 223.

The authors point out the frequency with which choledochostomy is performed with negative findings. This frequency may be decreased by the use of cholangiography at the operating table in those cases in which doubt exists as to the necessity for this exploration.

The injection of hippuran through the cystic duct is preferred to puncture of the common duct to prevent bile leakage which necessitates drainage and to prevent obscuration of the picture by spilled contrast media. A second film is recommended after choledochostomy to determine the results of the operative procedure.

One hundred and five cases are reported, 39 of these showed normal cholangiograms and the ducts were not opened. Only 2 of the patients have had symptoms subsequently suggestive of stones in the common duct. For this reason the authors believe that the cholangiogram is not to be relied upon in the presence of small stones or bile sand in the common duct.

In 21 patients cholangiography was done before and after the common duct was opened. Two cases showed a block at the ampulla believed to be due to spasm since no organic pathology could be found. Eight cases showed a normal picture before the duct was opened, 7 of these pictures were proved correct, while 1 patient had stones in the common duct. Thus in this series 93.6 per cent of the findings were correct. Of the 13 patients remaining in this group all were diagnosed from cholangiograms to have obstruction. Eleven of the diagnoses were correct. The 2 errors were substantiated by later cholangiography. In 1 case there was no stone and in the other the stone was not found until a later operation.

Fourteen patients had cholangiography only after exploration of the common duct. Nine of these had stones in the common duct and after removal of the stones the cholangiograms were normal. The subsequent history of these patients has indicated the presence of more stones in the common duct in only 1. The remaining 5 patients in this group had no stones in the common duct on exploration, 4 of them had correspondingly normal cholangiograms. The fifth showed a dilated duct, but patent ampulla, in the cholangiogram. A subsequent choledochoduodenostomy was performed for the relief of the symptoms. The check-up cholangiograms were thus correct in 92.8 per cent of the cases.

Postoperative cholangiography is useful in the determination of when the drainage tube should be withdrawn and was proved correct in 94.7 per cent of 76 cases.

The authors state that cholangiography is unnecessary in those cases in which the history or examination of the ducts at operation is sufficient to indicate choledochostomy, but that as a check-up following such exploration it is invaluable.

THOMAS C. DOUGLASS, M.D.

Laird S M *The State of the Heart in Gall Bladder Disease* *Brit M J* 1938 1 834

Laird reports a personal study of 65 consecutive cases of gall bladder disease admitted to the wards of Mill Road Infirmary, Liverpool. The diagnosis of gall bladder disease was based on the symptoms, clinical findings and cholecystography.

All cases treated by surgery were studied during convalescence, examined carefully at the end of four weeks and followed up for over a year. There was cardiac involvement in 50 of the patients. Twenty-four patients were regarded as obese. The presence of obesity in the operated cases appeared to mitigate the chances of cardiac improvement.

Thrombosis of the coronary artery occurred in 12 per cent of the cases of gall bladder disease. Cholecystectomy produced a cure of the gall bladder symptoms in 78 per cent of the cases. The presence of heart conditions in patients with gall bladder disease does not constitute a contra-indication to cholecystectomy. Laird is of the opinion that gall bladder disease is a definite etiological factor in myocardial lesions. **CARL GABSTOF M D**

Estes W L Jr *Acute Gangrenous Cholecystitis and the Use of Partial Cholecystectomy in Its Treatment* *Am J Surg* 1938 39 197

Acute gangrenous cholecystitis is most commonly due to circulatory changes in the gall bladder which occur as a result of the impaction of a stone in the cystic duct. Infarction and infection are usually secondary causes. The incidence reported by various surgeons varies from 12 per cent (Judd and Phillips) to 43 per cent (Estes) of all cases of acute cholecystitis. Perforation occurs in from 0.86 to 5.2 per cent of all cases of this condition treated in the hospital.

The author reviews the cases of 78 patients with acute cholecystitis. The condition was non-suppurative in 35 patients, suppurative in 39 and gangrenous in 34 patients. Perforation occurred in 9 cases and produced a localized pericholecystic abscess in 7 and an acute general peritonitis in 2.

The difficulty of clinical diagnosis is noted.

Close observation is recommended in considering the method of treatment of acute gangrenous cholecystitis. For patients with symptoms of perforation with spreading peritonitis, immediate surgery is indicated. Careful preparation for surgery is stressed.

If operative treatment is decided upon, the author believes that cholecystectomy if practical is the method of choice. In cases of gangrenous and suppurative cholecystitis, a much lower mortality (2.08 per cent) has been shown when partial cholecystectomy has been performed. In this procedure the free living portion of the gall bladder is excised, the wall is left attached to the liver and the cystic duct is not disturbed. In a follow-up study of 43 patients who observed no dietary restrictions, 81 per cent showed no recurrence of symptoms and 12 per cent showed a residual fatty dyspepsia. Four patients were operated upon later for stones in the common

duct. No vestige of a gall bladder remnant was found in these cases. The mortality rate in this series is compared with that reported in acute cholecystitis, which ranged from 13.5 to 3.2 per cent.

Cholecystostomy is reserved for the patients who are very bad risks. **THOMAS C DOT CLARK M D**

Glute H M and Albright H *The Complications of Gall Bladder and Stomach Surgery* *Am J Surg* 1938, 39 282

The complications of gall bladder and stomach surgery include all the possibilities for disturbances following any laparotomy. However, the authors consider only those most commonly related to surgery in these areas. Persistent fever usually indicates wound infection, cul-de-sac abscess or subphrenic abscess. Inspection, palpation and probing of the wound are necessary to demonstrate or exclude infection in the wound. Repeated rectal examinations may demonstrate a boggy collection of pus in the cul-de-sac. This should be evacuated when fluctuation is present. Subphrenic abscess appears more commonly on the right side but it was found on the left side in 2 instances in the authors' experience. It should be suspected (1) when postoperative x-ray shows a high fixed diaphragm with an obliterated or narrowed costophrenic angle, (2) when the x-ray shows either pleural fluid or consolidation of the lung by pressure of the elevated diaphragm on the affected side, (3) when there is an air bubble beneath the diaphragm and above the liver, and (4) when the patient has an unexplained fever following upper abdominal surgery.

Respiratory complications such as pleurisy, effusion, pneumonia and atelectasis may be found by physical signs or by the x-ray film.

Wound rupture may be partial or complete. At times the patient may feel something give away during a coughing or vomiting spell. This may be the origin of a ventral hernia. Immediate closure of the completely disrupted wound is most satisfactory. Adhesive strapping over sterile gauze is a very unsatisfactory makeshift.

Dehydration, hypochloremia, sodium chloride retention with edema and embarrassment of the circulation from overloading are complications incidental to postoperative fluid balance. If edema is caused by irritation of the diaphragm or of a reflex arc involving the phrenic nerves, the cause should be sought according to the classification of Mayo. Prevention of distention by the early use of morphine, intestinal suction and gastric lavage with sodium bicarbonate solution may be helpful. Narcotics and sedatives and carbon dioxide and oxygen inhalations for not more than fifteen minutes at a time usually are effective. If the hiccup persists more than seven days, interruption of the phrenic nerve pathway may be necessary. Cervical infiltration of the phrenic nerve with 2 per cent novocaine should be done on one or both sides with the patient under the fluoroscope and the effect on the excursions of the diaphragm should be noted.

Injury to the common duct occurs most commonly because the duct is clamped during an attempt to control a bleeding cystic artery or because the common duct is pulled up with the cystic duct and is tied or cut off. Obstructive jaundice appearing within a few days after cholecystectomy, especially if not accompanied by pain, usually indicates injury to the common or hepatic ducts and in the authors' opinion demands an immediate secondary operation for correction.

Drainage of bile into the peritoneal cavity is dangerous because of the production of bile peritonitis. Distention, ileus, nausea, vomiting, and death may follow. This may result from too early removal or slipping of the T-tube in the common duct. If the patient's condition permits, re-operation with re-insertion of the tube is indicated.

Stones remaining in the common duct may be demonstrated by lipiodol injections through the T-tube. The use of ether to "dissolve" the stone has been reported.

Hemorrhage in a case of gall-bladder disease without jaundice usually indicates bleeding from an uncontrolled cystic artery stump or from damaged liver tissue, or oozing from a plexus of veins overlying the common duct. Serious hemorrhage warrants transfusions and re-operation to control the hemorrhage. In the jaundiced patient pre-operative preparation should be adequate with glucose, vitamin, and transfusions. Glucose administered post-operatively and repeated transfusions are found to be of value.

Postoperative hemorrhage in the patient with stomach disease indicates bleeding from the suture line or from an ulcer that has not been removed. Much more rarely esophageal or intestinal varix, or blood dyscrasia may be a cause. The authors recommend small transfusions, morphine, parenteral fluids, and glucose, and nothing by mouth.

"Liver failure" is a blanket term that in the absence of a post-mortem examination covers a variety of conditions associated with serious depletion of the vital forces. In the patient gravely ill with cardiovascular and renal disease the prospect of "liver failure" is great and efforts should be made to improve these organs.

Vomiting following gastric surgery occurs because of obstruction at the site of anastomosis from edema. The use of suction with full knowledge of fluid and chloride balance will overcome this difficulty. Jejunostomy has been done in the left upper quadrant under local anesthesia to supply the patient with the necessary proteins. Peritonitis is avoided by careful suture to prevent leakage and by the avoidance of contamination. The authors do not drain the site of the duodenal stump unless there has been soiling of the area or unless it is found that a not wholly satisfactory closure of the stump has been made.

Pancreatic or biliary fistula if persistent are serious and require reconstructive surgery.

MANUEL E. LICHTENSTEIN, M.D.

Dunlop, G. R., and Hunt, E. L.: *Acute Pancreatitis*
New England J. M., 1938, 218: 376

The authors report the cases of 14 patients with acute pancreatitis, with a mortality of 14.3 per cent. They agree with the contentions of Rich and Duff, and believe that the following sequence of events is logical in acute pancreatitis: (1) obstruction of the pancreatic ducts, (2) rupture of the duct-acinar system, due to back pressure, (3) escape of tryptic ferments, (4) necrosis of vessel walls, and (5) hemorrhage into the interstitial tissue with necrosis of the gland.

In these patients, the pain was less agonizing than that which is usual, and while generally referred across the upper abdomen, it was sometimes localized in either upper quadrant.

Pain which persists until shock supervenes is highly suggestive. While the pain is general in the upper abdomen, there is commonly a point of maximum tenderness about 5 cm. above the umbilicus. If the foramen of Winslow is open the irritating contents will spill into the general peritoneal cavity, otherwise this remains in the lesser omental sac.

Differential diagnosis may be very difficult and involve consideration of the corrosive poisons, coronary attacks, perforated appendix, ruptured duodenal ulcer, acute intestinal obstruction, rupture of a distended gall bladder, mesenteric thrombosis, ruptured ectopic pregnancy, and biliary-tract disease. In the majority of cases showing elevated blood sugar and elevated urine amylase, blood sugar determinations and the Wohlgemuth test for urine amylase proved of most value.

The treatment is surgical, and operation should be done at the moment which seems best to the competent and experienced surgeon. Such a surgeon will allow no unnecessary loss of time in the fulminating case, will not hurry in the less acute case, and will not neglect suitable measures to combat shock, relieve emesis, and restore the acid-base balance.

The surgical aims are: (1) to complete the diagnosis by accurate visualization of the lesion, (2) to drain away any tryptic ferments by drainage of the lesser omental sac, (3) to decompress the pancreas by multiple nicking of the peritoneal covering of the gland, and (4) to decompress an obstructed pancreatic duct system by drainage of the biliary tract by the method that seems most appropriate to the patient's condition. The complications, which may be many and varied, must be treated as they arise.

JOHN WILTSIE EPTON, M.D.

Cole, W. H.: *Acute Pancreatitis, with Special Reference to Pathogenesis and the Diagnostic Value of the Blood Amylase Test*. *Am. J. Surg.*, 1938, 39: 245.

Cases of acute pancreatitis may be divided roughly into two types: the acute edematous, or interstitial type, and the acute hemorrhagic, or necrotic type. It is possible that the acute edematous type is caused primarily by obstruction, while the acute

necrotic type occurs as a result of tryptic digestion within the gland. The symptoms in the former type are milder and are never associated with shock. Analysis of the various clinical reports in addition to the author's observations shows an increase in blood amylase in acute pancreatitis only. This is about as reliable in the acute interstitial forms as in the fulminating forms except that a normal or low reading may be encountered more frequently in the latter group. There is a rise of blood amylase from its normal level of 90 to a level of 150 within a few hours and in a day or two this may be as high as 1000. (Readings are expressed in terms of milligrams of sugar produced by the amylolytic action of 100 c cm. of serum on a given amount of starch.) The blood amylase level falls gradually until the normal threshold is reached within two or three days after the onset of the symptoms. It may return to normal many days before the symptoms subside although often there will be a direct correlation between the return of blood amylase to normal and the subsidence of symptoms.

Urinary diastase determinations are of diagnostic value. However there is a great variation between blood amylase and urinary amylase. The test is positive in more than 50 per cent of the cases of pancreatic cysts. In carcinoma of the pancreas the test shows an increase in only a few cases. In chronic pancreatitis the test is negative.

A low blood amylase level in the light of recent work, is an indication of hepatic disease. The author observed such an instance in a patient with considerable destruction of the liver by cysts. A low amylase level may be found after a sudden elevation in the amount of amylase in the blood stream. The liver and pancreas cease to produce amylase during the period of elevation, but although the elevation disappears within a few days the return to normal production takes from eight to twenty days.

MANUEL E. LICHTENSTEIN, M.D.

Joachim H. and Banowitz M. M. A Case of Carcinoma of the Islands of Langerhans with Hypoglycemia. *Ann Int Med* 1933 11 1754

Most of the numerous cases of spontaneous hypoglycemia due to pancreatic tumors reported in the past ten years have been due to hyperfunctioning adenomas of the islands of Langerhans. Islet carcinoma as a cause of this syndrome has been relatively rare.

To the 7 cases previously reported the authors add another which occurred in a woman thirty one years of age. Vague symptoms had been present for one month and recurrent convulsions and coma for three days. Laparotomy revealed a pea sized indurated gland along the lesser curvature of the stomach and in the terminal half of the pancreas a nodular mass about the size of a tangerine and several large glands. The spleen had to be removed to get at the mass in the pancreas. Only part of the tumor could be removed. Sections showed carcinoma of the pancreas with lymph node metastases.

Convulsions and coma occurred four days after operation and daily thereafter in spite of almost continuous glucose administration. The patient died forty two days after operation. The cells of the tumor were definitely small but otherwise normal roentgenologically. No autopsy was obtained and no attempt was made to demonstrate the presence of insulin in the tumor tissue.

Y. ALTER H. DANIEL, M.D.

MISCELLANEOUS

Marshall S. F. and Labey F. H. The Surgical Treatment of Abdominal Fistulas. *Ann Eng Land J* 31, 1933, 218-221.

The authors present a study of fistulas arising from the small and large intestine, together with reports of illustrative cases including a case of pancreatic fistula in which the patient was successfully operated upon.

The most common cause of abdominal fistula is infection which produces gangrene and perforation of the bowel. Fistula may also be caused by injury to adjacent loops of bowel during an operative procedure. Severe trauma to the abdomen may be the primary cause of a fistula of which the case of pancreatic fistula reported in this paper is an example. The following table outlines the cases of abdominal fistula arranged according to etiology.

TABLE I—CASES OF ABDOMINAL FISTULA

Etiological Factor	No. of Cases
Appendicitis perforated	10
Diverticulitis of sigmoid perforated	9
Regional ileitis perforated	4
Pelvic operation (other than for tuberculosis)	4
Tubercular operation (with tuberculosis)	2
Carcinoma of colon	3
Trauma to abdomen	3
Gastric operation	1
Richter's hernia ileum	1
Total	53

A complete history frequently gives more accurate information as to the origin of the tract than the roentgenological examination nevertheless the latter should always be made so as to establish the existence of obstruction which is often present and also to indicate the pathological condition involved such as regional ileitis diverticulitis and fistulous communication with other viscera.

Many operations for the closure of abdominal fistulas result in failure because the underlying pathological condition has not been recognized. A general discussion of the principles involved in the surgical treatment is given. Many fistulas will close spontaneously. Those however which are persistent or which have certain underlying pathological conditions require operations which in most cases are extensive and serious.

Six cases of fistulas are reported together with the operative method employed for the eradication of the fistula in each case. These are well illus-

trated In the authors' series of 37 ~~cases~~ ²² patients were submitted to operation Five died after operation, this was an operative mortality of 19 per cent
JOHN H GARLOCK, M D

Benedict, E B : Peritoneoscopy. *New England J M*, 1938, 218 713

The author uses the Ruddock peritoneoscope for direct inspection of the abdominal and pelvic cavities The biopsy forceps is equipped with a small telescope so that biopsies can be taken under direct vision A diathermy connection permits coagulation of the bleeding points

The author states that when patients are carefully selected peritoneoscopy is attended with very little risk Patients with serious pulmonary or cardiac disease are not good risks Abdominal adhesions may complicate the procedure, but by careful selection of the site of puncture the author has avoided difficulties Ruddock is quoted as having punctured the bowel in 8 of 500 examinations but without contamination of the general peritoneal cavity Such examination is contra-indicated in inflammatory conditions

Peritoneoscopy may be indicated in any abdominal or pelvic condition when the diagnosis is obscure or when additional evidence is needed for confirmation of a diagnosis or for a decision as to the type of treatment The information thus obtained will frequently be the deciding factor, for or against laparotomy The author has found peritoneoscopy useful in cancer, cirrhosis, tuberculous peritonitis,

ascites, pelvic tumors, ectopic pregnancy, and ovarian dysfunction

He states that the advantages of peritoneoscopy are that it is a minor procedure performed under local anesthesia through an incision 1 cm in length, and that it requires only one day of hospitalization

In two years the author has made 48 examinations, and in 1 case he believes that pneumoperitoneum may well have been a contributory cause of death No true errors in diagnosis were made An ovarian cyst was aspirated under direct peritoneoscopic vision in 1 case, that of a woman eighty-nine years of age

EARL O LATIMER, M D

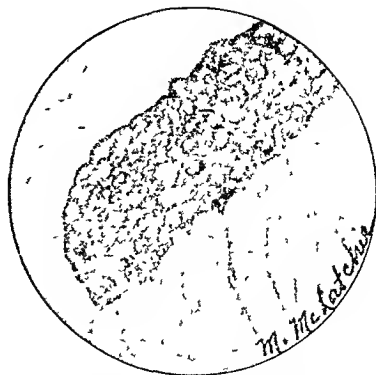


Fig 1 Typical appearance of small, cirrhotic, hobnail liver

GYNECOLOGY

UTERUS

Bernabei D. Biology of the Lower Uterine Segment (Sulla biologia del segmento uterino inferiore) *Folia demographica gynaecologica* 1938 35 23

The author presents an exhaustive review of the literature on the biology of the lower uterine segment and then attempts to correlate these various clinico-experimental contributions.

All evidence points towards the lower segment as being an autonomic distinct structure with the same anatomical physiological and pathological characteristics as the corpus and the cervix during the gravid puerperal and non gravid states. It is from 0.5 to 1 cm long. Its limits are not exact but it extends approximately from the point of peritoneal reflexion anteriorly on the uterus to the angle of anteflexion with the cervix, and the cavity includes that portion between the triangular cavity of the corpus and that portion of the cervical canal where the plica transversalis of the cervical mucosa has its beginning.

The microscopic limits are distinct, the cavity is the straightest portion of the uterine canal, the mucosa is more smooth than that of the corpus, the epithelium is lower and contains nuclei which are situated near the center of the cell, the glands are arranged exactly opposite those of the corpus and the cervix being lower externally and higher internally and they have a cystic tendency.

The walls of the lower uterine segment are prevalently muscular and stand out in contrast to the corpus by having elevated segments, spiral muscle fibers and in sagittal section give an appearance of a circular fibrous structure.

The blood supply seems to be autonomic. The lymphatic circulation is common with that of the cervix. Its innervation is by way of the ganglion of Frankenhauser with rich sensorial endings both superficial and deep and many autonomic nervous system ganglia. It participates only lightly in the premenstrual and menstrual phases of menstruation.

During pregnancy it participates in the same modifications as the corpus but is less marked in the first trimester. After the third month the muscle fibers having been contracted relax and the mucosa undergoes decidual transformation to a lesser degree than that of the corpus. During the third trimester the lower segment becomes thinned and is distinctly limited by the corpus and the cervix. At term the height of the lower segment measures from 6 to 7 cm and comprises approximately one-third of the uterine cavity. During parturition the membranes are adherent to practically all of the spongy layer of the lower segment mucosa.

The musculature contracts less actively than the corpus and with diverse effect from that of the corpus during the period of dilatation.

After labor this so-called isthmus retracts rapidly to return to its normal state while its cavity only partially returns to its pregravid state.

During pregnancy the mucosa may be the site of placental insertion in part or completely and the walls may become rigid or spastic and obstruct labor or may be the site of rupture from various causes.

And finally it would appear that the lower segment of the non gravid uterus forms a barrier to pathological inflammatory or neoplastic processes of the cervix which might invade the uterus.

George C. FROLA M.D.

Cotte G and Nottet A. Cancer Developing in the Cervical Stump Following Subtotal Hysterectomy (Sur la cancérisation du moignon cervical après hystérectomie subtotale) *Gynec et obst* 1938 37 161

Après la discussion à la récente Congrès de la French Gynecological Society on cancer developing in the cervical stump after subtotal hysterectomy the authors report their clinical observations on the subject extending over a period of fifteen years.

Brief résumés of 7 cases are presented. Five of these were treated by radium and x ray irradiation and 2 by operative means. One of the 2 patients operated upon died. Cures were reported after thirteen twelve and two years six months several weeks and several days and 1 patient could not be followed up.

In all of these patients the carcinoma originated after a minimum of three years following subtotal hysterectomy and in no instance was there evolution of a pre-existing cancer. Only in one instance have the authors ever observed an unrecognized cancer of the cervix, a pre-existing ulcerative lesion of the cervix which developed rapidly soon after a subtotal hysterectomy.

Among 250 neoplasms of the cervix observed over a period of seventeen years the authors report the incidence of cancer of the cervical stump as 3 per cent. For the Anticancer Center of Lyon Ponthus gave a statistical report of 9 cases of cervical stump cancer in 950 neoplasms of the cervix or approximately 1 per cent. Monod gives 31 per cent. The authors do not concur with the statement that cancer of the cervical stump is more prone to follow subtotal hysterectomy performed for the removal of fibroids because in their series only 2 patients were operated upon for fibroids.

From the standpoint of therapy all those cancers which fall into Classes I and II of the Geneva Classification should respond well to either surgical treatment or that treatment which employs physical agents except that surgery particularly of the Wertheim type is much more difficult after subtotal hysterectomy.

The success of radium therapy in carcinoma of the cervix is well recognized, and since cancer of the cervical stump does not differ from cancer arising from the cervix, the authors believe that radium therapy is the treatment of choice

GEORGE C. FINOLA, M D

ADNEXAL AND PERIUTERINE CONDITIONS

Dannreuther, W. T. · The Frank-Geist Operation for Congenital Absence of the Vagina. *Am J. Obst & Gynec.*, 1938, 35 452

The author reports the case of a patient nineteen years of age, upon whom he performed the Frank-Geist operation successfully. The article is well illustrated.

The Frank-Geist technique includes three distinct operative steps, with minor procedures occasionally interspersed, numerous dressings, and meticulous attention to detail. The first operation consists of making a skin flap $6\frac{1}{2}$ in long and 3 in wide on the inner aspect of the thigh and converting it into a pedicled tube. The skin edges are slid together beneath the tube and approximated with interrupted silk sutures. After three weeks the distal attachment of the tube flap is incised slightly on each side under gas or local anesthesia. The detachment is carried further a few days later, and only a small area of attachment is left in the center.

The second operation is done about four weeks after the first. The narrow remaining attachment of the distal extremity of the flap is completely severed and the line of union on the under surface of the tube is re-opened throughout its entire length. After trimming the scar tissue from the cut edges, the flap is temporarily wrapped in a large gauze pad which has been wrung out in hot saline solution. The tissue partition occluding the vaginal space is incised transversely and two of the operator's fingers are insinuated between the bladder and rectum up to the peritoneal reflection.

The flap is then inverted so that the skin surface is inside, and draped over a hard rubber vaginal plug of appropriate size, through the top of which a small hole has been drilled. After proper disposition of the tissue over the plug so that the pressure is everywhere equalized, the lateral margins of the flap are fastened together with 3 plain catgut sutures. The pedicle is rotated 180 degrees toward the vaginal introitus and the flap-covered plug is inserted into the newly created vesicorectal space. Three or four interrupted sutures fix the free end of the flap to the vaginal orifice. A Pezzer self-retaining catheter is introduced into the bladder and left for eight days. Continuous pressure on the vaginal plug is maintained by means of an overlying rubber sponge and a tight "T" binder. At the end of two weeks the new lining of the vaginal canal is found tightly adherent to the adjacent tissues, so that the vaginal plug can be removed and replaced at the patient's convenience. By the end of the third week, when the entire field is dry, the detachment of the flap from

the covered margin of the vaginal canal can be started. It is severed little by little, as in the case of the distal extremity.

The third operation consists of completing the detachment of the flap at the vaginal orifice, freshening the granulating area and skin margins at the base of the flap, introducing a few more catgut sutures at the introitus, and replacing the severed tongue of skin flap in the bed from which it originated.

EDWARD L. CORNELL, M D

Puente, J J : Anatomicoclinical Forms of Lymphogranulomatous Vulvovaginal Lesions and the Anorectal-Genital Syndrome (Formas anatómicas clínicas de la estiomene de la vulva y del síndrome anorectogenital). *Rev méd Lat-Am.*, 1938, 23 367

Puente states that in its evolution venereal lymphogranulomatosis presents in the female certain peculiar clinical features which are quite different from those encountered in the male.

After having exposed some of the clinical and epidemiological aspects of the problem, which has still remained obscure in some of its phases, the author classifies, from a practical point of view, these types of lesions into 4 groups: (a) lymphogranulomatous lesions localized exclusively at the external genitalia (esthiomene, chronic ulcerative elephantiasis of the vulva, anterior syndrome), (b) lesions localized exclusively at the anorectal region (anorectal syphiloma of Fournier, proliferative and stenosing anoproctitis), (c) a combination of the two forementioned forms (anorectal-genital syndrome), (d) lesions localized in the internal genitalia with or without rectal lesions. The author is primarily interested in lesions mentioned under groups (a) and (c).

Lymphogranuloma of the vulva (esthiomene) is defined by the author as a polymorphous affection of the external female genitalia, characterized by a slowly progressive clinical course. The condition is often subjectively asymptomatic. The most common manifestations are (a) ulcerations of the vulva, which may be superficial or deep. The lesions present irregular borders and rest upon a reddish-blue base. They are indolent and resist all treatment, (b) nodules and abscesses, especially at the labia majora, (c) fistulas which are constantly present in all processes complicated by the presence of rectal lesions. Other clinical manifestations include the presence of fibrous bands, velvety and myrtiform vegetations, edema of the urinary meatus and elephantiasis.

The author excludes from this group a certain lesion which has been called "simple chronic ulcer of the vulva" which according to all presumptions is not due to venereal infection but may result from ovarian insufficiency, repeated traumatism, and certain pathogenic or saprophytic organisms.

Jersild's anorectal-genital syndrome is characterized by the presence of a proliferating and stenosing anoproctitis, firm condylomas and fistulas

in addition to the vulvar lesions. In a certain proportion of cases general manifestations make their appearance such as fever, constipation, and skin eruptions. Lesions in the fundus of the eye have also been described such as papilledema and vascular tortuosities.

Concerning the cause of these conditions 152 of a series of 170 patients reported in the literature gave a positive reaction to the Frei test. The incidence of concomitant syphilis, soft chancre and gonorrhea varies greatly according to those authors who studied the problem. The gonococcus does not seem to be implicated in the production of these lesions. In a number of cases a definite lymphogranulomatosis had to be excluded and the condition was attributed either to tuberculosis or to syphilis. Amebic dysentery has been regarded by some as being etiologically related to some lymphogranulomatous processes especially those involving the rectum exclusively.

Since 1924 the author has observed 7 cases of lymphogranulomatosis which illustrate well the fore-mentioned clinical picture. In 4 patients the Frei test was frankly positive. In 1 case the test was at first negative but later became positive. The last 2 cases were observed prior to the advent of the diagnostic Frei test but their clinical course was typically that of lymphogranulomatosis.

It is interesting to note that in one of the patients of this series there was found at autopsy a marked amyloidosis and an infiltrating and stenosing process in the terminal portions of the large intestine resembling grossly and microscopically the lymphogranulomatous lesions usually encountered in the rectum. Only one case of this kind has been published in the literature.

After having briefly discussed the anatomico-pathological and pathogenetic features of this disease group the author concludes that the edema and elephantiasis of the vulva are consequences of an obstruction along the regional lymphatics produced by the granulomatous process and not as Jersild believes consequences resulting from the destruction and blockage of the deep lymphatic circulation.

RICHARD E. SOMMER, M.D.

Hamar A. and Goebel A. The Symptoms and Treatment of Carcinomas of the External Genitalia. II. Mitt. Primary Urethral Carcinoma (Zur Klinik und Therapie der Carcinome am ausseren Genitale. II. Mitt. Zur Klinik und Therapie des primären Urethralcarcinoms). *Zentralbl. f. Gynæk.* 1937 p. 2526.

There were 14 cases of primary urethral carcinoma, and 7 cases of cancer designated as vulvo-urethral that were not utilized for the main statistical purposes given in this article. The authors state that during the period from 1932 to 1936 the frequency of urethral carcinoma as compared to all carcinomas was 16 per cent, gynecological carcinoma 55 per cent and vulvar carcinoma 23 per cent. In the 14 cases described in detail the average age

of the patients was fifty six and five tenths years. Two patients were thirty six years old and 1 more than seventy years old. According to their histories the disease existed during variable periods of time but most frequently it had not begun longer than three or four months before the patient was admitted to the clinic. The papillary form of carcinoma was most frequent; it was found in 9 cases. In 5 cases the tumor infiltrated into the deeper tissues. Histologically there were 3 squamous cell carcinomas, 2 cylinder cell, one basal-cell, and one epithelial-cell carcinoma of the urinary passages and one papillary carcinoma. In 4 cases no particular type of carcinoma was designated. Twice carcinoma was suspected as positive clinically, and as almost positive after pathologico-anatomical examinations.

No operations were performed, instead local irradiation with radium followed by roentgen ray treatment over the region of the groin was given. In the more extensive involvement of the inguinal gland extirpation was done. This was done in 2 of the cases here reported. The first 7 cases were treated by superficial radium irradiations; the last 7 were treated after 1931, with radium needles. The dose of the superficial treatment was from 4,500 to 5,000 roentgens, i.e., in 1 cm., with a depth of about 50 per cent. The dose of the radium needles was from 3 to 8 needles each of 1 mgm. placed deeply and parallel to the urethra, which was followed by a short superficial treatment of from 800 to 1,275 mgm/Elisd. According to photometric measurements on the phantom this is equivalent to 6,500 roentgens delivered in the tumor. It must be noted and it is also emphasized by the authors that the radiation treatment was not exclusive inasmuch as some of the tumors were curetted, wasted, ligated or excised. The excisions were done by them more for diagnostic than for therapeutic purposes. One patient had no recurrence in sixteen years after mere diathermic cauterization of a raspberry size papillary carcinoma and extirpation of the inguinal glands with mesothorium implantation.

In the summary the authors state that the total number of cases was 14, 3 of these were incurable and not treated; the number treated was 11. Eight of the patients are living and free from all symptoms. 4 of 7 are living for longer than five years. There was 1 intercurrent death after two and one half years. 1 death occurred from an unknown cause (section in this case showed no cancer) and 1 death was the result of cancer.

The experience of the authors shows that the papillary tumors are more amenable to cure than the infiltrating types. If to the 14 primary urethral carcinomas the afore-mentioned 7 vulvar tumors with vulvo-urethral foci are added and included in the statistics 21 of the 31 cases were symptomless and 6 of the 20 cases showed a five year cure.

In an appendix 2 cases of primary urethral cancer are discussed; these came for treatment after these reports were completed. The report of these 2 is

accompanied with a photographic demonstration of the findings and roentgenological control showing the beds of the radium needle

(KRAATZ) MATHIAS J SEIFERT, M D

MISCELLANEOUS

Zondek, B.: Menstruation-Like Hemorrhage in Rabbits Induced by Gonadotropic Hormone *J Obst & Gynaec Brit Emp*, 1938, 45 1

The author prefaces the report of his experiments by a discussion of the interrelationship of the hormones of the ovary and the anterior lobe of the pituitary gland with respect to menstruation. It has been observed that menstruation can be delayed in the human being by the administration of large doses of follicular hormone. There are two possible explanations (1) the follicular hormone directly inhibits the development of the corpus luteum and, thus, the formation of progesterone, and the progestational phase of the endometrium, or (2) the follicular hormone indirectly suppresses the development of the corpus luteum by inhibiting the production of Prolan B, the luteinizing hormone, by the anterior lobe of the pituitary gland. The author believes that the latter explanation is correct, as he has achieved partial suppression of the function of the anterior lobe in rats and chickens by prolonged estrone administration. He states that folliculin inhibits the secretion of Prolan B and causes an overproduction of Prolan A. As the pituitary gland seems definitely to be an important link in the suppression of menstrual bleeding by follicular administration, *per contra* the pituitary gland is probably responsible for the initiation of the impulse for the bleeding of menstruation.

The work of Smith, Tyndale, and Engle is discussed. These authors produced menstrual bleeding in hypophysectomized monkeys by first injecting estrone for ten days to cause endometrial proliferation, and then progesterone for another ten days to convert the proliferated endometrium into the progestational type. Menstruation occurred three days after the last injection. This work seems to indicate that menstruation is caused exclusively by the ovarian hormones, quite independently of the anterior lobe of the pituitary gland. Zondek is skeptical of this and wonders what substance determines the duration of life of the corpus luteum and, thus, the duration of progesterone production. He speculates that it might be the shift in the ratio of Prolan A to Prolan B, or possibly a special bleeding hormone produced by the pituitary gland quite independent of the follicle-stimulating and luteinizing principles.

Various kinds of uterine hemorrhages are distinguished. It is pointed out that a variety of substances may produce uterine bleeding which is not true menstruation. True menstrual bleeding is that which occurs into a mucosa which has first been stimulated to proliferate by folliculin, and which is later converted to the progestational type by progesterone.

Although menstruation does not occur as a normal physiological part of the sexual cycle of rabbits, the author was able to produce pseudomenstruation in these animals by the intravenous injection of gonadotropic hormone. The bleeding was similar to that of menstruation in that it was a hemorrhage into the proliferated, folliculin-stimulated mucosa, with uprooting of the mucosa and the escape of blood into the uterine cavity and the vagina. This occurred only after intravenous injection. Both prolactin from pregnancy urine and prosylan, gonadotropic hormone derived from pregnant mare's blood, were equally effective. This effect could be produced about four times as frequently in infantile animals as in mature animals. In some of the uteri there were areas of true progestational changes in the endometrium. Bleeding occurred only in the proliferative areas, never in those showing progestational changes. The author deduces from this that the corpus-luteum hormone and its stimulant, Prolan B, suppress bleeding, not cause it.

In other animals, this type of bleeding could not be produced by the administration of estrone, estradiol, nor progesterone. On the other hand, pseudomenstruation could not be produced in castrated animals by first injecting folliculin, to cause proliferation of the endometrium, and later, prolactin. The author concludes that "there must be a third, separate factor in the ovary which is important for the bleeding mechanism." He further believes that the ovarian bleeding factor is mobilized by Prolan A, and not by a third pituitary principle.

The types of experiments are described in detail. A number of drawings, some in color, illustrate the type of bleeding produced.

DANIEL G MORTON, M D

Schleyer, E: Reciprocal Relations Between the Inflammatory Diseases of the Female Genital Organs and the Rectosigmoid Flexure, and Their Treatment (Ueber Wechselbeziehungen zwischen entzündlichen Erkrankungen des weiblichen Genitales und dem Rectum-Sigmoid, sowie ihre Behandlung) *Wien klin Wchnschr*, 1937, 2, 1519

The following results were obtained from a systematic investigation with the rectoscope in inflammatory diseases of the female genital organs, as well as from gynecological explorations, in cases of proctosigmoiditis.

Of 100 women with inflammatory disease of the adnexa and parametrium, 72 had proctitis or proctosigmoiditis and 28 had a normal rectosigmoid condition. The largest percentage of proctitis (79%) was found to be on the left side, while the number on the right side was 26.7 per cent and the percentage of ambilateral cases was 77.7%. Proctitis was present in 83.3 per cent of the cases of posterior parametritis. Of 50 women with proctitis or proctosigmoiditis, 16 or 32 per cent had a normal gynecological condition, 24 or 48 per cent had a parametritis or adnexitis, especially on the left side, as well

as posterior parametritis. As a control a number of patients with non-inflammatory genital tumors, myomas, cysts, and tubal pregnancies were subjected to a rectoscopic observation. Of 50 such cases 43 or 86 per cent had a normal rectoscopic condition 7 or 14 per cent had proctitis. As a proof of the intimate connection between the inflammatory genital diseases and ailments of the rectum and the sigmoid flexure, 6 histories of disease were reported. In this connection, one must be prepared not only for a possible invasion of inflammation from the genitalia into the lower intestine, but also for the opposite process. It is not always easy to say which organ is to suffer first. In most cases, constipation plays an important role.

In the therapy of inflammatory diseases of the female genital organs it is necessary to take into consideration the adjacent part of the intestine. If the existence of proctosigmoiditis is revealed it will be necessary to treat it first in which case the therapy consists in effective measures to suppress constipation, such as insufflation with dermatol, or a cecosalbolus under rectoscopic control and eventually torantul injections. During the differential diagnosis between the inflammatory and non-inflammatory genital tumors the rectoscopic findings can furnish an important indication revealing a normal tumor more as a non-inflammatory, and a sigmoiditis more as an inflammatory, genital tumor. The reason why a large number of women suffering with genital diseases fail to be freed from their condition is that the adjoining sigma or the rectum is also diseased or is even the cause of the inflammation. (HANS HEIMLER) CLARENCE C REED M.D.

Dougal D. The Problem of Endometriosis. *Am J Obst & Gynec* 1938 35 373

In the author's own series of 241 cases of external endometriosis one or both ovaries were involved in 103 patients the rectovaginal space was involved in

62 patients and the ovaries and rectovaginal space in 71 patients. In the remaining 3 patients the lesions were in other situations.

Pelvic infection and new growths of the uterus and ovaries either benign or malignant may be complicated by endometriosis but with the exception of uterine fibroids their association is too rare to be anything but accidental. For every 100 cases of uterine fibroids there are 6 cases of internal and 25 cases of external endometriosis and the latter is encountered as the principal lesion or as an important complication in not less than 10 per cent of all abdominal operations on the female genital organs.

Menorrhagia or epimenorrhagia was complained of in about 40 per cent of the cases and may be extremely severe, especially if the uterus is involved.

Eighty eight per cent of the patients between the ages of thirty and fifty were operated upon 28 per cent of these were under thirty five years and 10 per cent were under thirty. Twenty per cent of the patients were single. Excluding women in whom there were associated uterine fibroids single women and women who had been married less than three years 40 per cent of the remainder were sterile 33 per cent had not been pregnant for at least ten years and 23 per cent had not been pregnant for at least five years.

When the lesions are extensive treatment must be radical either surgical or radiological. The author prefers to remove the uterus together with both appendages, preferably by total hysterectomy. It is unnecessary and in fact dangerous to dissect out growths from the bowel wall. Only 2 of his patients have become pregnant after conservative treatment and a considerable number have not obtained complete relief. There were 3 deaths in 262 operations 1 from peritonitis and 2 from embolism an operative mortality of a little over 1 per cent.

EDWARD L. CORVILL M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Johnstone, R. W.: The Interaction of Pregnancy and Associated Disease *Brit M J*, 1938, 1 765

Until the early part of the present century, general medical diseases associated with pregnancy, while not wholly in the province of either the obstetrician or the physician, were generally regarded as "complications" of pregnancy, and treated as such by the obstetrician. Nowadays the obstetrical specialist is almost always also a gynecologist, and therefore he is more inclined to the study of surgery than of medicine. Endocrinology in relation to gynecology has been leading him back in some degree to medicine. However, rarely has the obstetrical specialist been able to keep pace with the developments of modern medicine. The co-operation of physicians in cases of pregnancy and labor associated with general disease is more frequently noted. The author believes these cases ought usually to be regarded as instances of pregnancy complicating general disease.

In 4 series of maternal deaths in Great Britain (2 analyzed officially, and 2 unofficially), the deaths of 25 per cent, based on the lowest computation, and of 40 per cent, based on the highest computation of the totals, are attributed to associated diseases. In each of these series of deaths the same 3 disease groups were found to dominate the picture almost to the exclusion of anything else, namely heart disease, non-tuberculous respiratory disease, and kidney disease.

The death of mothers is not the whole tragedy, there is the comparative fruitlessness of the fatal pregnancies. In other words, the effect of the diseases upon the pregnancies, or upon the health of the child if born alive, is the corollary of the dangerous effect of pregnancy upon the disease. In the 1935 Scottish report covering over 2,000 maternal deaths, only 40 per cent of the infants were born alive. This figure includes a very large number of obstetrical emergencies, and is not confined merely to cases of associated diseases. If from the latter are chosen the main disease groups, the following figures are obtained:

Maternal deaths due to	Fetal deaths per cent
Heart disease	59
Non-tuberculous respiratory disease	70
Renal disease (including pyelitis)	68
Tuberculosis	55
Anemia (? plus malnutrition)	42

Corresponding figures for 2,136 maternal deaths in Scotland were essentially the same.

The incidence of heart disease was below 1 per cent in 39,000 pregnancies in Scotland, and yet in both English and Scottish reports it was responsible for over 49 and 75 per cent, respectively, of the

total maternal deaths from all causes, both obstetrical and medical, and in each series was responsible for about 25 per cent of the deaths attributed to associated diseases. Thus the importance of these associated diseases is noted. They account for between one-quarter and one-third of the maternal deaths, and in the mothers who survive they cause definite ill health in 10 per cent of the cases, and lastly, a huge wastage of fetal and neonatal life is the result.

Disease means that some organs are partially disabled. Pregnancy means that increased demands are put on all the mother's organs. Therefore, if pregnancy occurs in a woman who is already suffering from disease, it superimposes conditions of strain upon already disabled organs, while if disease originates after the pregnancy has already begun it introduces an element of disablement to the pre-existent conditions of strain. To watch how the diseased organs behave under the new conditions becomes a fascinating study, while to determine whether the experiment may safely be allowed to continue, or whether, and just when, it must be interrupted calls for the exercise of wide knowledge and nice judgment. The author illustrates his thesis by discussing the modern treatment and prognosis in cardiac disease, the latest ideas on anemia in pregnancy, the relation of Vitamin B to polyneuritis, and the change in our conception of diabetes since the advent of insulin.

ROBERT M. GRIER, M.D.

LABOR AND ITS COMPLICATIONS

Colvin, E. D., and Bartholomew, R. A.: Improvements in the Paraldehyde Method of Relief of Pain in Labor. *Am J Obst & Gynec*, 1938, 35 589

Complete amnesia as to pain in labor can be obtained in fully 98 per cent of the cases through the use of paraldehyde. The technique has been simplified by the oral administration of 24 ccm of the drug. Facilities for restraint of the patient's wrists to the sides of the bed should be available, better to protect the patient and lighten the duties of the attendant. Pituitary extract dropped into the nose is a valuable and safe aid in overcoming any prolongation of a temporary inertia. Control of the patient for final cleansing, draping, and delivery is greatly facilitated by the induction of light primary ether anesthesia during crowning of the head, just before moving the patient to the delivery room.

A mild degree of apnea or sluggishness in breathing or crying is to be expected in about 12 per cent of full-term, normal babies but is of no serious significance and is easily overcome. If paraldehyde is given in premature labors, coramine should be given to induce more prompt and thorough expansion of the lungs. The incidence of forceps delivery is not increased.

EDWARD L. CORNELL, M.D.

Wetterdal P. Some Notes on the Premature Rupture of the Membranes *Acta obst et Gynec Scand* 1933 18 45

The author reports the study of 1222 cases of labor in which there was a loss of amniotic fluid prior to the onset of pains. Two distinct groups were noted: those labors completed within eighteen hours and those taking more than eighteen hours. In the former the complications amounted to only 15 per cent and in the latter to 42 per cent. In parturitions starting long after the passage of water the time taken by the actual labor may be very short and complications then are as a rule very few. In parturitions starting soon or late after the premature passage of fluid when the labor is long (over twenty-four hours), the complications are numerous. This is believed to be due to weak and ineffective pains. Figures show that the risk is especially great when the discharge of waters is soon followed by weak ineffective labor. Such cases must be regarded as dangerous and requiring special attention; the parturition must be assisted by suitable means among which are included the administration of thymophysin and digital dilatation of the os uteri. The author warns against combining quinine and thymophysin as in his experience this may easily lead to cramp-like labor. He does not believe that premature rupture causes the primary weakness of pains but that this is a primary factor.

A study was made also to determine whether there was an increase in physical or psychical defects or perhaps a higher mortality at birth or later. It is conceivable that the more or less dry labor resulting in a premature rupture of the bag might increase trauma due to parturition, more particularly as the os uteri will then be dilated by direct pressure on the head of the fetus instead of by pressure against the membranous bag. Two thousand children were studied and there was no difference whatever between the group delivered after premature rupture and the total group in either spontaneous or forceps deliveries. ROBERT M. GAIR, M.D.

Kretzschmar N. R. and Huber C. P. A Study of 2987 Consecutive Episiotomies. *Am J Obst & Gynec* 1938 35 631

The authors report on 2987 consecutive episiotomies from the standpoint of immediate healing, coincident morbidity, incidence of infection, and end results. They believe that a sufficiently large series has been summarized to eliminate the majority of errors which might be due to individual factors. The following conclusions are presented:

1. Infection of the episiotomy wound is a minor but significant cause of puerperal morbidity.

2. The incidence of infection is greater in those cases in which the condition is repaired with silk worm gut suture but the average infection in this group is less severe.

3. The incidence of infection in both types of repair increases rapidly with the complexity of associated obstetrical procedures.

4. The morbidity and end results depend upon factors other than the type of suture material used in the repair. EDWARD L. CORNELL, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Abramson M. and Berman I. Factors Affecting the Blood Loss in the Third Stage of Labor. *Am J Obst & Gynec* 1938 35 626

The present study is based on an analysis of 1,638 births at the Minneapolis General Hospital, Minneapolis, not including multiple births, cesarean sections, and certain incomplete records.

Of all the factors studied, none has any marked relation to the blood loss. The age of the mother, her blood pressure, and probably her gravidity have no measurable effect. The height and weight of the mother and the total length of labor have a very small but significant relation. The weight of the infant and the weight and area of the placenta are related a little more closely to the blood loss. On the average, the tall heavy woman who has a long labor will lose more blood than the short thin woman who has a short labor. On the average, too, a large baby and a large placenta will result in a greater loss of blood than a small baby and a small placenta.

Not one of these factors, however, approaches the importance of the management of the third stage of labor, for it is through the improvement of technique of management that the average blood loss has been reduced from over 500 c.c. at the beginning of the century to about 225 c.c. at the present time. EDWARD L. CORNELL, M.D.

Ross J. R. Prolactin—Its Effect on the Secretion of Woman's Milk. *Endocrinology* 1938 22 419

Prolactin was administered intramuscularly to mothers whose daily breast milk secretion on the fifth and sixth days was less than 400 c.c. The injections were given twice daily over a two-day period. One group of patients received a total of 400 U, whereas the second group received a total amounting to 1,000 U. A control group of patients received intramuscular injections of normal saline solution.

Administration of the higher concentration of prolactin appeared to increase slightly the secretion of breast milk during the remainder of the patients' stay in the hospital. Of much more significance, however, was the fact that 7 of 12 patients receiving this higher concentration of prolactin whose records could be followed after discharge from the hospital nursed their infants completely, whereas of 8 observed patients receiving the lower concentration of prolactin only 2 were able to nurse their infants completely. Of the 8 patients who received normal saline solution only 1 nursed her infant completely.

Rather severe local reactions followed the injection of the large amount of prolactin. It is probable that further purification of prolactin will eliminate these reactions. The administration of prolactin apparently has no effect on the fat protein or ash con-

tent of the breast milk secreted. The galactagogue effect which was obtained justifies further investigation of the value of this product. The urinary excretion of estrin in these cases was within the range found during the normal menstrual cycle

J THORNWELL WITHERSPOON, M D

MISCELLANEOUS

Husmann, W.: Injuries of Mother and Child Resulting from Abnormal Pelvic Presentations (Schaedigungen von Mutter und Kind bei Beckenendlagen) Duesseldorf Dissertation, 1937

The author discusses the obstetrical material of the Woman's Clinic of the Academy of Duesseldorf with reference to the injuries sustained by the mother and child in abnormal pelvic presentations. These statistics are based upon 9,229 labors occurring between April, 1928, and April, 1935. From all the pathological presentations (5 per cent), the non-viable and twin cases are deducted, which leaves 3.17 per cent for statistical studies. Among these, there were breech presentations in 80.8 per cent, foot presentations in 18.5 per cent, and knee presentations in 0.7 per cent.

Among the 461 abnormal presentations, 67 per cent of the mothers or children sustained injuries, 3 patients died (0.65 per cent), 2 after cesarean section although during labor fever was already present.

The third death resulted from a post-partum paralytic ileus. Excluding these 3 cases, 133 (29 per cent) prophylactic episiotomies were done and 7 cervical-os incisions, in 59 cases (13 per cent) lacerations occurred.

The various lacerations were tabulated and given in percentages, among these was one rupture of the uterus following manual liberation and extraction of the placenta. Primipara were injured 4.4 per cent more frequently than multipara. Atonic post-partum hemorrhages occurred in 31 cases (6.7 per cent), 5 patients had an elevation of temperature during labor, and 74 (16 per cent) had puerperal temperatures. An incipient rupture of the bag of waters occurred in 19 per cent, and a premature rupture in 4.8 per cent of the cases. Following these 109 labors, there was a puerperal temperature in 22 per cent.

Among the 461 abnormal presentations, 26.7 per cent of the babies died, 87 in the uterus, 36 after delivery. After deducting premature children and twin labors, the author records an infant mortality of 9 per cent.

The statistical report closes with reference to the relationship between infant asphyxia and the mechanism of tentorial lacerations of the newborn.

The appendix contains several clinical histories of abnormal pelvic presentations.

(ALBERS) MATHIAS J SEIFERT, M D

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Wesson M B Renocolic Fistula *J Urol* 1938
39 589

In this article the author reports his experience with 3 cases of renocolic fistula which were treated by nephrectomy and closure of the fistulous opening into the gut.

Before a renocolic fistula can form, according to the author, there must exist a chronic inflammation

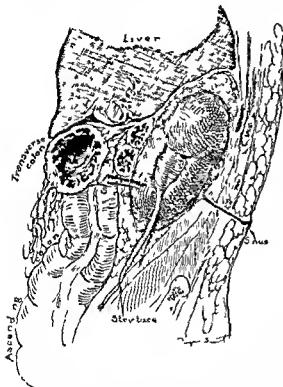


Fig 1 Perirenal abscess with resultant renocolic fistula external sinus and ureteral stricture. A loop of duodenum lies between the colon and the kidney directly above the sinus.

of the kidney associated with a perinephritis or perinephritic abscess. The 3 cases reported occurred as a result of (1) tuberculosis (2) infection and (3) trauma.

The author arrives at the conclusion that renocolic fistula is not such an uncommon condition as the literature would lead one to believe.

D F MCCRAY M D

Dean A L Jr Radiation Therapy of Tumors of the Renal Parenchyma in Adults *J Urol* 1934
39 303

The author claims that the closest co-operation between urologists, radiologists and pathologists is required to establish scientifically our knowledge of tumors of the renal parenchyma and their treatment. The urologist should assume the full responsibility for the management of each patient. He must know the natural history of these tumors and make a clear cut diagnosis of the presence of a renal tumor, the extent of its local development and the presence of metastases. The pathologist assists in making a pre-operative diagnosis if biopsy a parietal is employed and classifies the tumor after its removal. He must give the final opinion regarding the efficacy of pre-operative irradiation. The greatest value of aspiration biopsies is that of the differentiation between cysts and tumors. The use of irradiation can be evaluated by careful gross and microscopic studies of tumors which have been removed following treatment by irradiation. Tumors of the renal parenchyma in adults are distinctly radioresistant. Since there may be no difference in the microscopic picture between the natural changes and those caused by irradiation, the pathologist cannot determine exactly the amount of change to attribute to irradiation in a given case.

The urologist is justified in the following evaluation of external irradiation by the usual high voltage units in the management of tumors of the renal parenchyma in adults:

1 External irradiation alone cannot be relied upon to cure these tumors.

2 Pre-operative irradiation will probably decrease the size of the tumor from 20 to 40 per cent which may greatly facilitate nephrectomy.

3 External irradiation will not make an inoperable tumor operable. Inoperable tumors are those which penetrate the renal capsule. Large size alone does not constitute absolute inoperability as the surgeon's skill is an important factor.

4 If tumor cells are disseminated by trauma pre-operative irradiation may partially but not entirely prevent the disaster.

5 During pre-operative irradiation and the subsequent period in which the radiation takes effect, metastasis may occur.

6 If a renal tumor is only partially removed postoperative irradiation may slow up the recurring growth but will not stop it.

7 There is considerable difference in the radio-sensitivity of metastases. Metastases in bones are only slightly inhibited while pulmonary metastases may disappear.

If irradiation is to be employed the patient and all of his diagnostic data should be referred to the radiologist who should be told whether pre-opera-

tive, postoperative, or exclusive irradiation is to be employed. The radiologist's procedure should be as follows: (1) accurately locate the tumor for the placement of skin portals, (2) choose the most efficient combination of factors for the x-ray unit employed, (3) adjust therapeutic details so that (a) violent reactions will not occur in the tumor, (b) maximal regression will occur, (c) nephrectomy will not be prevented or delayed because of injury to the skin or superficial tissues, and (d) the general health of the patient will be maintained, (4) compute the tissue dose received by the tumor and assist the pathologist in correlating changes found in the tumor with the dose of irradiation given.

The therapeutic details, with the use of a 200 kilovolt unit outfit, are as follows:

The pre-operative cycle includes 3 skin portals (anterior, lateral, and posterior), each about 10 by 14 cm in size, a target skin distance of 70 cm, a filtration of 2 mm of copper, and a daily dose of 250 roentgens to a single portal, making a total of 2,500 roentgens to each portal. In a man weighing about 150 lb, this will amount to about 5 threshold erythema doses. This cycle consists of 30 treatments in a month. The blood should be kept in good condition, checked by counts every five or seven days and, if necessary, transfusion should be given.

If the tumor is inoperable, or if postoperative irradiation is required, 4 portals are advantageous. Other factors are the same as in pre-operative irradiation, and all of the skin covering the side of the body at the level of the affected kidney is used. As much as 3,000 roentgens may be given each portal. This provides a substantially larger depth dose and the region of the renal pedicle receives more than 7 threshold erythema doses. In favorable cases, after a suitable rest period, this cycle may be repeated either wholly or in part. LOUIS NEUWELT, M D

McNeill, W. H., Jr., and Chulko, A. J.. The Status of Surgical and Irradiation Treatment of Wilms' Tumor, and a Report of 2 Cases. *J Urol*, 1938, 39: 287.

Many urologists have declared that nephrectomy offers the only hope for the cure of Wilms' tumor. It is believed by some that x-ray irradiation pre-operatively, followed by nephrectomy, is the best method of treatment. A small group of surgeons favor x-ray irradiation and nephrectomy, followed by another course of x-ray therapy, or radium packs postoperatively. No one, with the exception of Pohle and Ritchie, has given x-ray therapy a full trial with any measure of success. Dean and Pack, in 1932, stated that irradiation alone was of no value and that no patient at the Memorial Hospital, New York, had been cured by irradiation alone, with the equipment available at that time. They stated that after x-ray irradiation has been given and the tumor was reduced in size, nephrectomy should be

performed. They believe that the radiosensitivity of these growths depends upon their congenital origin, embryonal structure, and unstable vascularity, the high rate of metabolism of the tumor cells, and the anatomical character of the cells. Some investigators believe that x-rays reduce the size of Wilms' tumor but that the tumor becomes radio-resistant after repeated exposures, thus necessitating increasingly large doses to keep it confined. There are others who believe that although irradiation reduces the size of the tumor, it has something to do with the production of metastases.

In a series of 383 cases reported in the literature, or seen personally, the mortality rate was more than 90 per cent. Six types of treatment were followed: (1) nephrectomy alone, (2) serum in conjunction with nephrectomy, (3) x-ray therapy followed by nephrectomy, (4) x-ray therapy and nephrectomy, followed by another course of x-ray therapy, (5) nephrectomy followed by postoperative x-ray treatment, and (6) x-ray therapy alone. With the latter procedure, success has been reported by Pohle and Ritchie in the cases of only 2 patients who were under treatment for from three to three and one-half years.

The authors report the case of a boy, fourteen months of age, with a movable, non-tender mass about the size of a large orange in the right loin. There were no other symptoms and the urinalysis and blood count were normal. Complete roentgenographic examination of the child confirmed the presence of an enlarged kidney and the absence of metastases. Pyelography confirmed the diagnosis of Wilms' tumor. Irradiation was started at once and the kidney reacted immediately, and at the end of one month the mass was hardly palpable. The child was under treatment for almost three years and was given 10,319 roentgens of x-ray irradiation. There was no skin reaction at any time and the child steadily gained in weight. Pyelography now shows the affected kidney to be greatly reduced in size, and even slightly smaller than the opposite kidney. The child is reported to be alive and well three years after the inception of irradiation.

The authors also report the case of a boy six years of age, with a mass the size of a small orange in the right loin, which was discovered during a routine examination. Thorough clinical study was delayed and the mass had reached the size of a watermelon at the time of operation, one month later. A section of the mass revealed a Wilms' tumor. Because of the large size of the tumor, the kidney was not removed. The wound healed, and several x-ray treatments were given without any noticeable improvement. Death occurred about four months later.

In view of the appalling results of other methods of treatment, the authors believe that x-ray treatment is worthy of further trial and investigation.

LOUIS NEUWELT, M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS ETC

Pereira, S. The Influence of Vascular Disturbances on the Growth in Length of the Bones (*L'influence des troubles de la vascularisation sur la croissance des os en longueur*) *Rev d'orthop*, 1938 23 140

A series of experiments were carried out on young rabbits to determine the influence of vascular disturbance on the growth in length of bones.

The main artery of an arm or leg was ligated and in other cases ligated and sectioned at the base of the member. There was no difference between the growth in length or thickness of the bone on the side operated on from that on the normal side. Roentgenograms of the bones made repeatedly after ligation or section of the main artery showed no difference from those of the normal leg. The cartilages of the two tibiae studied microscopically presented no distinct differences.

After ligation of the femoral artery and vein there was no difference noted between the growth of bone in either length or thickness on the operated from that on the non operated side. Repeated roentgen examinations taken after ligation of the vessels showed no difference between the bones of the legs which were operated upon and those which were not. Microscopic study of the cartilage of the inferior extremity of the tibia of the operated leg and the corresponding cartilage of the tibia of the opposite leg (non operated) showed that there was no appreciable morphological difference between the two. The organization of the cartilage and the ossification were uniform on the two sides. The depth and thickness of the beds of cartilage had not been modified by the ligation of the large vessels. The same results were obtained in experiments on both anterior and posterior extremities.

The artery and vein of a member were ligated and then both sectioned. There were no growth differences in the length or thickness of the bone between the members which were operated upon and those which were not. The roentgen examinations of the bones repeated after ligation and section of the right femoral artery and vein showed no difference between the leg which was operated upon and the normal leg. Cartilages at the distal extremities of the forearm have not been modified in their morphologic structure. When the cartilages of the posterior extremities were compared with the corresponding region of the normal side, very slight diminution in the growth of the cartilage on the side operated upon was noted. It was not accompanied by any modification of the different details of the morphological structure of the cartilage. The small difference between the cartilages of the two sides had not influenced the growth. Roentgen examinations

showed little evidence of any appreciable inequality in the length or the thickness of the two bones.

In order to determine the vascular disturbance during the process of endochondral ossification by direct action on the vascularity of the diaphysis the circulation of the diaphysis was disturbed by sectioning the bones $1\frac{1}{2}$ cm proximal to the distal cartilage of the posterior extremity. Furthermore the distal $1\frac{1}{2}$ cm portion of bone was isolated entirely from the surrounding structures although the periosteum was not touched.

Temporary interruption of the vascularity of the bones was obtained. Roentgen studies of the bones of these animals showed that growth in the length of the bone has not been limited. The production of callus allowed the diaphysis to resume its continuity and the process of ossification so that the roentgenogram did not show any modification of growth. Histological examination showed that the cartilage of the side operated upon was quite similar to the normal cartilage of the opposite leg. There was no morphological difference in the thickness of the different cartilages or of the morphological or cellular elements of which they are made.

In another series of rabbits, vascularity was disturbed either by (1) resection of periosteum and the perichondrium of the inferior half of the diaphysis of the forearm, or (2) resection of all the periosteum of the diaphysis and the perichondrium between the superior and inferior cartilages. Here definite changes in the growth in the length of the bone was noted. Repeated roentgen examinations showed definite bony changes. Histological examination of the cartilages at the distal extremity of the two forearms did not show any notable modification.

Resection of the periosteum of the diaphysis between the superior and inferior conjugating cartilages and resection of the perichondrium of the two conjugating cartilages were performed. Results showed that the bones were not as long as the normal.

The conjugating cartilages had preserved their normal structures but their thickness had been diminished. In another experiment this result was much more accentuated as shown by shortening of the diaphysis. The conjugating cartilage had undergone profound changes, the thickness varying considerably and the normal structure was lost. Ossification was also found to be very irregular and retarded.

The findings in this group of experiments would suggest:

1. The vascularity of a bone must be very markedly disturbed in order to modify endochondral ossification and the growth in length of bone.

2. Temporary diminution of the vascularity of a bone either by ligation of the large vessels or by interruption of all the vascularization of the diaphyseal segment adjacent to the conjugating cartilage.

does not alter the normal growth in the length of bone

3 The growth of bone has been modified in those cases in which the diaphysis has been entirely isolated from its vascularity as well as in which resection of the diaphyseal periosteum and perichondrium of the conjugating cartilages has been performed

4 It is assumed that the periosteum and the perichondrium play an equal rôle along with the vascularity in the growth in length of the bone

RICHARD J. BENNETT, JR., M D

Harrison, J. H.: Epidermoid Carcinoma in Osteomyelitis. Case Report. *Am J Cancer*, 1938, 32 527

Only one case of epidermoid carcinoma in osteomyelitis is reported among 365 cases of osteomyelitis cared for during a period of twenty-two years at the Peter Bent Brigham Hospital in Boston

A forty-seven-year-old woman gave a history of injury to her left leg eighteen years previously. The course of this case was osteomyelitis with both operative and spontaneous drainage from the left tibia. Two fractures of the left tibia had occurred before the patient was admitted to the hospital for treatment

Physical examination revealed extreme emaciation, pallor, bilateral inguinal lymph-node enlargement, and the disease process in the left leg. The left leg from the knee to the ankle including the entire anterior, medial, and lateral aspects was ulcerated and had many sinus-tract openings. The leucocytes in the blood numbered 12,800 per c. mm.; the erythrocytes 3,850,000 per c. mm., and the hemoglobin was 55 per cent. Biopsies of several regions of the granulated surface of the skin edge showed epidermoid carcinoma. Roentgenograms demonstrated irregular thickening of the soft tissues and a picture compatible with chronic osteomyelitis in the middle and lower thirds of the tibia. A mid-thigh amputation was performed under spinal anesthesia. The patient made an uneventful recovery. Two courses of 750 roentgen units were administered

On microscopic examination all sections taken from the external aspects of the leg showed the nodular tissue to be composed of epidermoid cancer of a fairly well differentiated type. Acute and chronic inflammatory reactions were present throughout the neoplastic tissue. A section from the osteomyelitic cavity again showed epidermoid carcinoma. Other portions of bone from the tibia and fibula showed acute and chronic osteomyelitis

Carcinoma developing in osteomyelitic foci is one of slow progression. Because of the tendency of the tumor to remain localized a good result may be expected after amputation of the involved limb. No case of carcinoma secondary to osteomyelitis in which there was distant metastasis has been found in the literature. Biopsy of nearby enlarged lymph nodes has shown only chronic lymphadenitis

In the case reported, the patient was well and without evidence of metastasis twenty-four months after operation
RICHARD J. BENNETT, JR., M D

Tavernier and Dechaume: Volkmann's Paralysis
(A propos de la paralysie de Volkmann) *Rev d'orthop*, 1938, 25 97

Two cases are presented which were observed and operated upon three days and three weeks, respectively, after the onset of Volkmann's paralysis. The authors state in an unquestionable manner that the elementary lesion is an infarct in the subaponeurotic region of the forearm

The first case was that of a girl eight years old who developed a supracondylar fracture of the right humerus with considerable anteroposterior displacement. The fracture was reduced under anesthesia and a splint applied. On the next day the arm was found to be swollen and the fingers anesthetized and paralyzed. On the third day, operation was performed through a long incision over the anterior portion of the right elbow. The superficial muscular aponeurosis was found to be very tense and dark in color. Incision of the aponeurosis relieved this marked tension and the color changed from black to a good red. A week after operation anesthesia and paralysis of the fingers still persisted

A second operation was performed seven weeks following the first at which time the median nerve was found between the broken humeral fragments

Seven months following the second operation there was great improvement although the fingers were still in contraction. One year following the first operation the hand was still in a contracted position although the sensory changes had entirely cleared up

Five years following the first operation there still remained a simple contraction of the flexors. When the wrist was flexed to 135 degrees the fingers could be extended almost completely and the action of the fingers and thumb in this position was almost complete

Pathological examination of a piece of muscle removed at the first operation showed the muscular fibers to be normal. There were practically no white blood corpuscles present and the diagnosis of hemorrhagic infarct was made

The second patient was a boy, ten years of age who injured his wrist and received no immediate treatment. After three weeks there was considerable pain and he was seen by a doctor and the forearm was immobilized

This patient was seen two weeks later at which time the hand had the typical claw appearance

Operation was performed twenty-five days after application of the splint. A very thickened muscular aponeurosis was found. The muscles were very tense, firm, and dark. The median nerve was found in the fibrous tissue near the middle of the forearm and after being liberated, appeared to be about half its normal diameter. The median nerve was transplanted

The results in this case were only mediocre. Some flexion and extension of the fingers could be carried out. The flexor muscles of the forearm were more supple than in those cases which were not operated upon.

Pathological examination showed that the muscular fibers were badly broken and interspersed with fibrous tissue. There was a very marked sclerosis without the evidence of inflammatory elements. The diagnosis of ischemic infarct was made.

In the first case the cause was apparently due to compression of the veins at the site of fracture and in the second case the origin was a definite constriction of the arteries.

Secondary operations such as those carried out after several days or several weeks after the original operation make possible the freeing of nerves and correction of the vicious or defective callus and have produced remarkable results.

The results in these two cases lead the authors to believe that early intervention in cases of this type will give a much better end result than in those cases which are allowed to progress without intervention. The choice of several procedures for use in late cases for relief of deformities and contractures is discussed.

RICHARD J. BENNETT, JR., M.D.

Mitch II and Green II H. Calcification About the Flexor Carpi Ulnaris Tendon. *Arch Surg* 1938 36 660

The authors report a series of cases exhibiting a new clinical syndrome of which very little has been mentioned in the literature. These cases typically show sharply localized pain and tenderness over the area around the pisiform bone, limitation of motion at the wrist, occasional signs suggesting an inflammatory reaction, and a characteristic roentgenogram.

Although there is a basic similarity in all the cases, some patients develop a hyperacute form which is hard to differentiate from an infection. The other cases are acute and with or without calcification about the flexor carpi ulnaris tendon.

No definite etiological factor can be established. Some cases suggest an infectious origin; others have a definite history of trauma or overuse. The authors believe that clinically the course of the disease is such to suggest a traumatic origin.

Apart from the tenderness and swelling over the pisiform bone and the limitation of motion of the wrist, the characteristic feature is the appearance of a radio opaque substance situated near the pisiform bone. The calcified mass may be circular, oval, or elongated, and probably the size and shape depend on the stage of the process and the intensity of the reaction. The calcification disappears with the subsidence of the clinical symptoms.

Since no pathological material has been obtained, the authors have been forced to infer that the location of the calcium deposit is either the flexor carpi ulnaris tendon, the peritendinous soft tissues, or an occasional bursa near the tendon. They believe it is located in the tendon.

Clinically, the condition must be differentiated from a stenosing tendovaginitis or an acute infectious process such as cellulitis or osteomyelitis. Usually simple rest or a splint, the application of heat and the administration of salicylates result in a prompt disappearance of the symptoms.

HARVEY D. ALLEN, M.D.

Brown II A. Enlargement of the Ligamentum Flavum. A Cause of Low Back Pain with Sacral Radiation. *J. Bone & Joint Surg* 1933 30 325

The literature was reviewed and 17 cases of enlargement of the ligamentum flavum were found to have been reported previously.

The history and symptoms of this condition are essentially the same as those of rupture and dislocation of a portion of an intervertebral disc and clinical differentiation between the two conditions is extremely difficult or impossible. In many instances these syndromes cannot be differentiated clinically from lumbosacral or sacroiliac disorders.

Subjectively there is a history of a relatively slight trauma. The interval between the onset of the pain in the back and radiation to the leg varies from a few hours to several months.

Seven additional cases are reported in this series. In patients with enlargement of the ligamentum flavum the pain is usually severe and often disabling. Sensory disturbances such as numbness and paresthesia may be present and there is likely to be some degree of motor weakness in the involved extremity. The symptoms are usually unilateral but may be bilateral.

Objectively there is usually some degree of scoliosis with a list to the unaffected side and there is a general restriction of movements of the back and limitation in raising the straight leg on the involved side. The most constant single finding was a decrease in the Achilles tendon reflex on the side of the lesion. Sensory disturbances of varying degree were present over the buttocks, the posterior aspect of the thigh, the calf, and the foot. The most common sensory alteration appeared over the outer aspect of the lower part of the leg and the dorsum of the foot.

Spinal puncture and the use of lipiodol are usually required for the diagnosis. An increase in the total protein content of the spinal fluid above 50 mgm per 100 ccm is suggestive of an intraspinal pathological process and was present in 3 of the 4 cases in which this determination was made. At least 4 ccm of lipiodol should be used.

The enlargement of the ligaments occurred between the fourth and fifth lumbar vertebrae in 6 patients and at the lumbosacral junction in 1.

An increase in the size of the ligament, a posterior protrusion of the disc or a combination of the two serves to compress the nerve root at its point of emergence.

Treatment consists of laminectomy, and a wide lateral removal of the enlarged ligament in order to

free the nerve root from compression. In all cases a careful search was made to determine the possible presence of a ruptured intervertebral disc. In 2 cases a very small prominence of the disc was noted in association with the enlarged ligamentum flavum. Any undue prominence of the disc, however, serves to decrease the size of the passage of the nerve root, so that even a moderate enlargement of the ligament would compress the root against it.

In most of the author's patients, rapid relief of the pain and gradual improvement in the impaired motor and sensory function followed removal of the ligament.

Seven cases are reported in detail, the first laminectomy being performed on February 17, 1937. The article was received for publication seven months later. During this time 7 laminectomies were performed. A further follow-up of these cases will be necessary in order that the end-results be reported accurately.

RICHARD J. BENNETT, JR., M.D.

FRACTURES AND DISLOCATIONS

Vulliet, M. The Evolution of Fractures in Children (*Remarques sur l'évolution des fractures chez l'enfant*) *Rev. med. de la Suisse Rom.*, 1938, p. 80.

Vulliet notes that in the last twenty years the number of fractures has greatly increased, economic considerations have made it necessary for surgeons to use such methods in treatment as give the best possible functional result in the shortest possible time. Many techniques of dealing with fractures have been developed and the general practitioner is sometimes in doubt as to the best method to use.

In adults the growth of the bones is completed and the process of repair of the bone is limited to the fracture and its immediate neighborhood, dislocations and displacements that have occurred tend to persist and overriding fragments result in a permanent shortening of the bone.

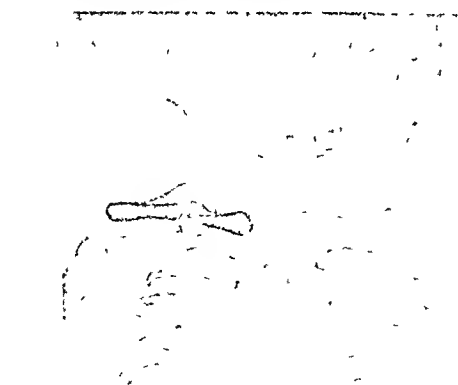


Fig. 1 Obstetrical fracture of the clavicle, roentgenogram fifteen days after birth shows exuberant callus.

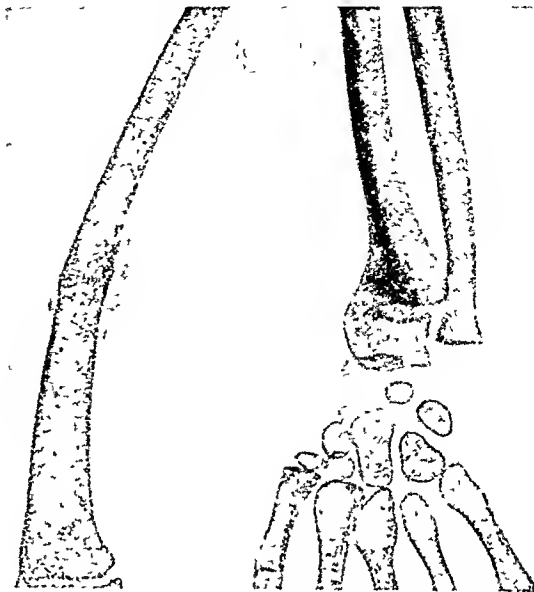


Fig. 2 Transverse fracture of the femoral diaphysis, reduction with slight angulation, heavy periosteal callus in the concavity of the angle.

Fig. 3 Transverse fracture of the metaphysis of the radius, with lateral and backward displacement of the lower fragment, roentgenogram nine weeks later shows formation of a large callus on the side of the displacement, tending to re-establish the normal axis.

With children this is different, the process of repair is not strictly localized, but is extended over the entire bone, changes take place not only at the site of the fracture, but at a distance from it, and modify the form of the bone. The entire bone participates in what may be called post-fracture reconstruction. At first the callus may seem exuberant, but as time goes on, it becomes firm where its support is needed and rarefied where it is not needed. The original shape of the bone is restored, and after several years the site of the fracture can be determined only with difficulty.

In children the periosteum is less closely adherent to the bone than in adults, and in many cases of fracture it is detached from the cortex of the bone for a considerable distance, the callus forms chiefly on the lower surface of the detached periosteum. This callus forms rapidly. The medullary callus forms late and is thinner, a clear space may persist for a long time in the line of fracture and may be mistakenly considered to indicate delayed union. However, there is no actual delay in healing of the fracture, the function is normal. The periosteal callus is formed so as to correct angulations and lateral displacements. In an illustrative case reported, that of a girl ten years of age, a transverse fracture of the diaphysis of the femur was reduced with a slight

angulation, the callus formed was much thicker in the concavity of the angle than on the opposite side which corrected the angulation. The medullary callus was thin. If there is a fracture near the epiphysis with lateral displacement, a similar phenomenon is observed: the callus is formed on the side of the distal deviation so as to efface it.

In certain diaphyseal fractures the periosteum may be detached only for a short distance and a small fragment may escape. In such cases the bone is repaired along its normal axis by periosteal callus formation; the fragment plays the rôle of a foreign body and is ultimately absorbed. If such a fragment is displaced backward in fractures of the elbow, it may interfere at first with the flexion of the forearm but with the normal process of growth the distance between it and the joint is progressively increased so that later it does not interfere with function.

However, the natural processes of bone repair in children do not always correct the results of a faulty or incomplete reduction of a fracture. In fractures of the external condyle of the elbow, for instance, excessive bone growth on the external side of the joint may occur in spite of correct reduction of the fracture and result in deformity.

The conclusion to be drawn is that in children the form of the fractured bone may undergo modification for a long time after the union of the fracture is complete. There is in any case a parallelism between anatomical form and function after fracture but in adults the function usually depends upon the form while in children function re-establishes the desirable form. In adults restoration of normal form depends upon a perfect primary reduction of the fracture. In children the process of the reconstruction of the anatomical form is less rigid; it is less dependent on the method of reduction and is not restricted by delay in union. ALICE M. MEYERS

Rocugno L. Traumatic Dislocations of the Elbow and Their Sequelæ in the Young (Sulle lussazioni traumatiche del gomito e i loro esiti nei giovani) *Minerva med.* 1938 39 332

The author found that dislocations of the elbow were most common in children and adolescents (75 per cent). Posterior dislocations were most frequent, occurring in 66.6 per cent of the cases. The next most common type was the posterior lateral dislocation which occurred in 13.2 per cent. Lateral dislocation occurred in 4.87 per cent. Isolated dislocation of the radius in 6.67 per cent and anterior dislocation of both bones of the forearm in 4.47 per cent. Nerve complications were present in 4.4 per cent of the cases and open reduction was necessary in 15.7 per cent of the cases.

The author is strongly opposed to early manipulation of the elbow and believes that under no condition should it be forced because this irritation frequently gives rise to the excessive formation of scar tissue and restricted elbow motion.

In old cases of dislocated elbow the author is in favor of leaving them alone if the arm is in a position

of good function from 80 to 90 degrees rather than of attempting any form of open operation as the results of late operations have been poor.

Numerous statistics from the literature are quoted and show that elbow dislocations are second only to those of the shoulder in adults but are the most frequent type of dislocation in infants and children.

The study of 45 cases of dislocation of the elbow is presented by the author. CARLO S. SCORRA M.D.

Kennedy R. H. The Treatment of Fractures of the Shaft of the Femur. *Ann. Surg.* 1933 107 419

The author has analyzed 120 consecutive cases of recent fractures of the shaft of the femur, treated at the Beekman Street Hospital, New York, from January 1924 to March 1932. The patients were treated by ten surgeons, and the open operative bone work was in charge of one of them only. The author believes that proper transportation of the patients to and within the hospital is a major factor in treatment. There were 17 early deaths in this series. In addition to the death following amputation, 2 other patients had amputations and survived. These were omitted from the study. Thus there remained 103 patients available for more detailed analysis of their treatment. Of these 48 were under sixteen years of age. Forty-seven received their injury as the result of motor car accidents. There were 4 compound, and 20 comminuted fractures. Seventeen fractures were in the upper third, 74 in the middle third and 10 in the lower third of the femur. These three groups are discussed separately. The primary hospital treatment was adhesive plaster traction in 103, Thomas splint suspension in 43 cases, skeletal traction in 35 cases, overhead adhesive plaster traction in 11 cases, reduction and application of a plaster spica in 11 cases and open reduction in 1 case. The initial treatment was unsatisfactory in 14 patients following adhesive plaster traction suspension and in 2 following reduction and application of a plaster spica. The final treatment, except for complications, was skeletal traction in 43, adhesive plaster traction in 2, Thomas splint suspension in 31, application of a plaster spica in 12, overhead adhesive plaster traction in 11 and open reduction in 4. Traction methods were employed in 84 per cent of these patients and in skeletal traction the tongs were removed after an average period of forty-nine days. In adults in whom traction only was used throughout the entire treatment it was all removed after an average of seventy-five days. Among the cases treated by skeletal traction there were 21 infections in 42 patients, 14 of these healing promptly after removal of the tongs or pins while 7 or 17 per cent were discharged for a long enough period so that it was believed that infection of the bone was present. There were 4 early open reductions, 3 in simple fractures and 1 in a compound fracture; all the patients being children. One had no internal fixation, a kangaroo tendon wire and a steel plate respectively were used in the 3 others. The compound fracture became infected, osteomyelitis de-

veloped, but solid union occurred. The others remained clean. The incidence of open operation in children was 8 per cent. Four patients sustained refractures on the fifty-sixth, seventy-first and ninety-ninth days after injury, and 1 outside of the hospital after nine months. Three patients had late open reduction for complications. One had an open reduction with steel plating on the seventy-sixth day for a refracture on the seventy-first day. Another had a bone transplantation from the tibia on the seventy-eighth day for delayed union. The third had an internal fixation with a steel plate one year after the accident for non-union. There was 1 death during treatment, which resulted from embolism in a patient while in skeletal traction. Of the remaining 100 patients, Kennedy knows that 84 developed a solid union and 1 had non-union. The other 15 could not be followed, but the author believes there was no reason, from the position of the fragments or the progress when last seen, to expect non-union in any of these. Complete function at the knee joint was obtained in 6 cases.

As a result of this study, Kennedy concludes that by these methods of traction, bony union with relatively little shortening and good functional results may be obtained in a high percentage of cases, but he does not believe the results are good enough. Overhead adhesive plaster traction was satisfactory in children under five years of age, but skin traction was unsatisfactory in children over five years of age, with regard to recovery of the original length. Skeletal traction in adults gave too high an incidence of infection. Kennedy is still unsatisfied with Russell traction and believes that more open reductions with internal fixation should be performed, more especially in transverse fractures of the middle third and in most of those in the lower third of the femur. Although skeletal traction has given a marked improvement over reduction and application of a plaster spica or adhesive plaster traction with the Thomas splint, no single method of treatment will apply to all cases and one should be ready to employ each type of treatment according to the individual indication.

EMIL C. ROBITSHEK, M.D.

ORTHOPEDICS IN GENERAL

Spink, W. W., and Keefer, C. S.: The Diagnosis, Treatment, and End-Results in Gonococcal Arthritis. *New England J. M.*, 1938, 218-453.

This article deals with the methods of diagnosis and treatment of gonococcal arthritis and the end-results.

The diagnosis of this malady is made from: (1) a history of local gonorrheal infection, (2) the presence

of gonococci in smears and cultures of urethral or cervical exudate, (3) positive gonococcal complement-fixation tests of either the blood serum or the synovial fluid, and (4) the presence of gonococci in the contents of the joints or tendon sheaths.

The patients were arbitrarily divided into three groups for this study.

Group I was comprised of 26 patients who were treated by medical means alone. This treatment consists mainly of the maintenance of the patient's general nutrition, the prevention of pain and deformity, the restoration of full function of the diseased joints by physical therapy, and the control of local genito-urinary-tract infection. Typhoid, paratyphoid, and autogenous gonococcal vaccines were used.

The average stay in the hospital of the patients in Group I was fifty days. Two patients died. Upon discharge, 18 patients or 75 per cent were completely free of all joint symptoms with no limitation of motion and with no roentgenological evidence of joint destruction. The remainder of the patients in the group had some evidence of pathological changes upon discharge.

Group II was comprised of 24 patients who had sufficient evidence of an effusion into one or more joint spaces to warrant aspiration of the synovial fluid in addition to medical therapy. One or more knee joints were aspirated in 21 of these 24 patients. The cultures of all these synovial fluids were found to be sterile.

The average stay in the hospital of the patients in Group II was fifty-three days. None of this group died. Fourteen patients or 48 per cent had complete recovery of joint function with no roentgenological evidence of joint destruction. The remainder of the patients had some temporary or permanent disability of the joints.

Group III was made up of 20 patients. The joints of these patients were aspirated, opened, and then treated by lavage. The surgical treatment was necessary either because the synovial fluid was so thick that all of it could not be aspirated through a needle or because of the presence of gonococci in the fluid. Gonococci were eradicated from the joint cavity by exposing the joint space and thoroughly washing it out with either warm saline solution or a 1 to 10,000 solution of ichloride of mercury.

The average stay in the hospital of the patients in the last group was sixty-one days. Gonococci were recovered from the synovial fluid of 15 patients, the fluid being sterile in 5. Only 3 patients or 15 per cent ultimately had no limitation of motion of the joints, the remainder had some permanent disability.

RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Wilson G and Ogston A G The Treatment of Peripheral Vascular Disease by Intermittent Venous Occlusion *Lancet* 1938 234 600

The authors discuss the method of Collens and Wilensky in which intermittent venous occlusion is used in the treatment of peripheral vascular disease. They use an apparatus consisting of an electrically driven pump fitted with an alternating mechanism and timing device. The results obtained by the authors in a series of cases including thrombo-angitis obliterans arteriosclerosis and embolism or thrombosis of a major artery to a limb appear very encouraging. In a large percentage of the cases marked improvement was noted in the intermittent claudication, the healing of gangrenous ulcers, and the relief of rest pain.

The authors describe a new apparatus which has been devised to produce intermittent venous occlusion. It is inexpensive and may be constructed in any laboratory, and because its application is simple it is possible for independent observers to investigate a large series of cases. Moreover, the apparatus is silent in action and can be operated by the patient in his own home if running water is available. Venous occlusion is produced by hydraulic pressure, brought about by an automatic siphon.

The authors have used this apparatus over a period of six months in the treatment of 10 cases of peripheral vascular disease. Although their series is far too small to permit any definite conclusions, the results have been sufficiently encouraging to warrant further trial. During the treatment all patients with intermittent claudication have shown an increased ability for walking. As Collens and Wilensky have pointed out, however, there is a tendency toward relapse after intermittent venous occlusion.

JOHN H GARLOCK M D

Knazovick, J Traumatic Extravascular Aneurysms and Suture of the Peripheral Arterial System (Traumatische extravasale Aneurysmen und Suturen des peripheren Arteriensystems) *Bratislav lek Listy* 1937 37 548

The author examined several patients who had been operated upon because of traumatic peripheral arterial aneurysms to determine the rôle of the collateral circulation in the ultimate nutrition of the peripheral portion of the limb and to see if and to what extent an accurately sutured artery is patent for the blood. Gunshot and lacerations of the radial, cubital, axillary, and posterior tibial arteries were treated by ligation of the vessel and 2 cases of gunshot injury of the femoral artery were sutured by the Carrel-Stich method. Arteriographic examination with thorotrast revealed surprisingly that the artery had not again become patent at the

site of suture. The form of the vascular shadow indicated that an almost complete obstruction due to thrombus had occurred. Following the operation, however, an extensive collateral circulation had developed (profunda femoris artery) and from this circulation a partially retrograde filling had taken place to which the entire arterial supply of the peripheral limb was due.

The previous assumption therefore as to the value of circular arterial suture is erroneous. Even a perfectly sutured artery is not sufficiently patent to permit an adequate supply of blood to the peripheral tissues. No one has as yet succeeded in demonstrating the re-establishment of the lumen in a sutured major artery. The practical conclusion which the author draws from this fact is that circular vascular suture and other vascular plastics must be abandoned as valueless. Simple vascular ligation should be done instead. The rest is done by the collateral circulation which has an astonishing capacity for overcoming the deficiency.

(LITHUAN) LEO M ZWIRSKIN M D

Linton R K The Communicating Veins of the Lower Leg and the Operative Technique for Their Ligation *Ann Surg* 1938 10 392

The long and short saphenous veins connect with the deep venous systems of the leg via the posterior tibial, anterior tibial, peroneal and popliteal veins by a series of communicating veins. In the normal state the communicating veins have valves which permit the blood to pass only from the superficial to the deep systems. In many cases of varicose veins these valves become incompetent and this abnormal condition often is associated with varicose ulcers. To effect a cure in such cases it is necessary to interrupt the communicating veins. Using data obtained from dissections of 10 lower legs and on the basis of findings which he obtained in 50 operations for ligation of the communicating veins, the author presents a detailed discussion of the anatomy of these veins.

For descriptive purposes they have been divided into the posterior tibial, anterior tibial, peroneal and popliteal groups. The posterior tibial communicating veins are found on the inner aspect of the lower leg. Usually they perforate the deep fascia posterior to the posteromedial edge of the tibia and pass forward to join the long saphenous vein over the crest of the tibia. The anterior tibial communicating veins arise from the anterior tibial veins and communicate with both the long and short saphenous systems. They extend forward on the inner aspect of the tibia in very close association to the periosteum. They perforate the deep fascia over the anteromedial surfaces of the tibia to join the long system of veins. The peroneal communicating veins arise from the peroneal veins and connect

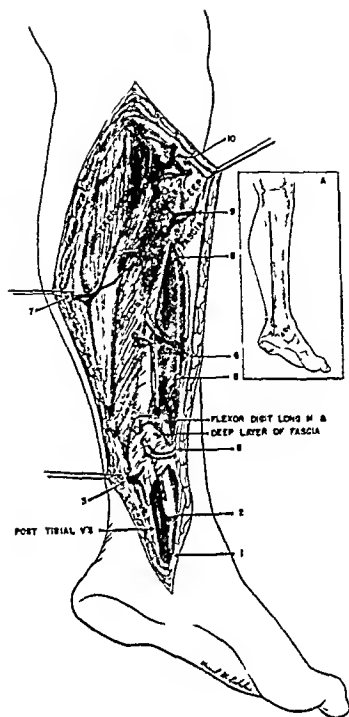


Fig 1.

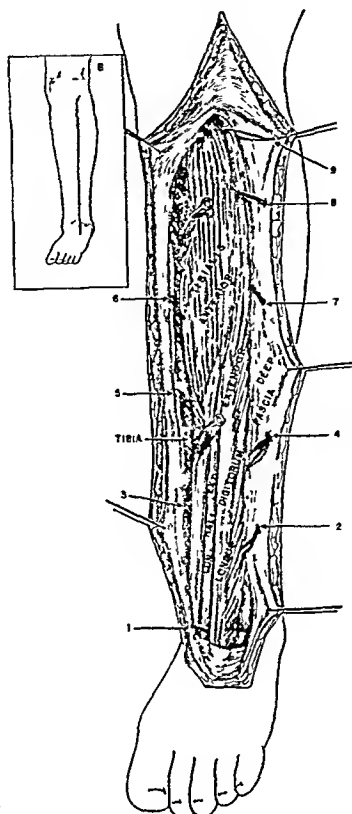


Fig 2

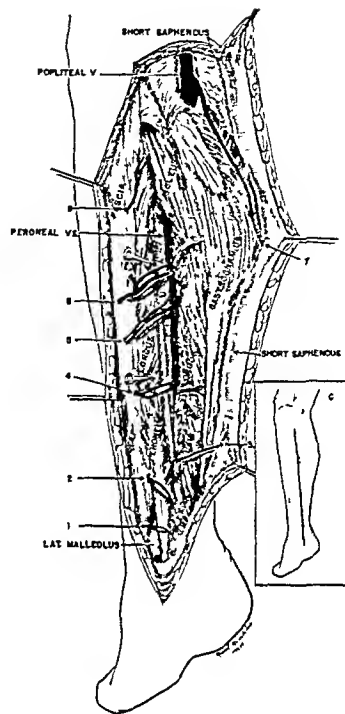


Fig 3

Fig 1 A dissection of the medial aspect of the lower leg to show the medial group of communicating veins. The deep fascia has been divided longitudinally on the medial side of the lower leg posterior to the tibia, and dissected from the muscles both anteriorly and posteriorly. In the upper portion of the leg the soleus muscle has been partially retracted. In the lower half the lamina profunda of the deep fascia has been cut exposing the posterior tibial artery and veins, and the flexor digitorum longus muscle. The latter muscle has been retracted to expose the medial side of the tibia. Nos. 1, 2, 3, 4, 6, 9 and 10 are posterior tibial communicating veins. Nos. 5 and 8 belong to the medial subdivision of the anterior tibial communicating veins. No. 7 represents a perforating vein which drains blood from the muscle through the deep fascia to the superficial veins. The inset shows the incision used in the operation for the ligation of these veins.

Fig 2 A dissection of the anterior aspect of the lower leg to show the anterior group of communicating veins. The deep fascia has been divided longitudinally midway between the tibia and fibula on the anterolateral surface of

the lower leg, and the anterior peroneal intermuscular septum incised to show the lateral subdivision of the anterior tibial communicating veins, Nos. 1, 2, 4, 7, 8 and 9. The tibialis anticus muscle is retracted laterally to show the central subdivision, Nos. 3, 5 and 6 on the lateral aspect of the tibia. The inset shows the incision used in the operation for the ligation of these veins.

Fig 3 A dissection of the posterolateral aspect of the lower leg to show the lateral group of communicating veins. The deep fascia has been divided longitudinally on the posterolateral aspect of the lower leg posterior to the fibula. The dissection has been carried down along the posterior peroneal intermuscular septum to the peroneal veins and shows the peroneal communicating veins, Nos. 1, 2, 3, 4, 5, 6 and 8. Posteriorly, the deep fascia has been elevated to show the popliteal communicating vein, No. 7. The short saphenous vein is shown superficial to the deep fascia with communicating veins Nos. 3 and 7 emptying directly into it. The inset shows the incision used in the operation for the ligation of these veins.

(Courtesy of J. B. Lippincott Co.)

them with the short saphenous system on the posterolateral surface of the leg. The popliteal communicating vein is not a constant finding, but when present, arises from the popliteal vein and joins the short saphenous vein.

In order to facilitate their surgical exposure, the communicating veins have been divided into 3 main groups: the medial, the anterior, and the lateral. The operation to ligate these communicating veins should not be performed until edema and infection

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

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(TRANSLATED) LEO M. ZIMMERMAN M.D.

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after transfusion is due to the stroma of destroyed blood cells.

Durán Jordá and Sardá Roca found that glucose added to citrated blood increases the globular resistance. In this study, as in others carried out by the transfusion service, it has been demonstrated that the addition of glucose augments the life of the various blood elements

Durán Jordá made daily microscopic studies on the same specimen of conserved blood which showed that the leucocytes are gradually destroyed, and become an amorphous mass by the fifteenth to twentieth day. The eosinophiles are most resistant to the action of time. The lymphocytes conserve their morphology much longer than the polymorphocytes. The chief cause of the fall in the white count is the destruction of the myeloid cells. The addition of glucose does not affect the destruction of the leucocytes

Durán Jordá and Benlloch Llorach found that by the sixth or seventh day the stored blood has lost half of its complement and by the fifteenth to twentieth day it is completely destroyed. Glucose prolongs the action of the complement and thus benefits the defensive action of the hematic alexin.

Durán Jordá and Soteres Díez state that the biological action of glucolytic ferments on the hematic glucose is a well known reaction. The Folin

and Wu technique was used in these determinations. It was found that the addition of glucose to blood retards the normal phenomenon of glucolysis, and augments the life of the blood. The difficulty is the decision to add glucose to the citrated blood. Clinically it was found that 1 gm. of glucose per 1,000 gm. of blood is sufficient. Clinical experience teaches us that the renal threshold for the elimination of glucose is over $2\frac{1}{2}$ gm.

Durán Jordá and Sardá Roca found that there is no noteworthy alteration in the urea content of conserved blood. It is thought that the cold completely destroys the ureolytic diastases. Glucose blood showed the same behavior.

The study on glucolysis led Durán Jordá and Villaró Closa to make a study on the other blood ferments. The electrolytic method was used in the presence of Lugol's solution. It was found that amylase disappears gradually from the blood. The presence of glucose neither retards nor accelerates this destructive process. These studies were carried out as completely original investigations without reference to the works of other investigators. The methods had to be adapted to the peculiar needs and conditions. In this original work the authors state that they did not "think with the brain of others" "no a pensar con el cerebro de los demás."

JACOB E. KLEIN, M.D.

have disappeared from the skin and subcutaneous tissues of the affected leg. Any ulcerations should have been healed for six weeks.

Healing of the ulceration is accomplished by placing the patient in bed and elevating the affected extremity on pillows. In many instances it will be hastened if the large ulcers are covered with large Thiersch skin grafts. After all ulcerations are healed and the infection is cleared up, a ligation of the long saphenous vein and its branches at the saphenofemoral junction is done. The short saphenous vein, if it is involved, should be ligated also at its termination with the popliteal vein.

The author presents a detailed description of the ligation of the various groups of communicating veins. All of the groups of communicating veins are rarely found to be incompetent. However it is not unusual to find that two groups in the same leg may be affected. The medial group is the one most commonly at fault. The clinical examination will usually suffice to indicate which group of veins requires ligation. **HENRY F. THURSTON, M.D.**

Homans J. Thrombophlebitis in Legs. *New England J. M.* 1938 218 594

The author believes that thrombophlebitis results from a combination of several factors among which a slow current and certain anatomical relations are pre-eminent. Thrombosis takes place only in a blood current, a slow one as a rule. It is not coagulation nor clotting in which the formation of fibrin is the principal reaction but rather a deposition of blood platelets that is thrombocytes on the wall of a vein. After having become plastered together and fixed, these thrombocytes build out into the stream a sponge-like structure to which the white corpuscles adhere and in whose narrow interstices clotting then occurs. This process soon occludes the vein. In its process of formation the tail of the thrombus may extend for a long distance away from the original attachment and it is *dot like and unsubstantial*. Should it grow into a current of blood it may become so soft and slimy that finally it can hardly be distinguished from normal blood. This type is a potential embolus. However the tendency of most thromboses is to stop abruptly and heal when they meet a vigorous blood current.

In the opinion of the author most thromboses occur in the absence of severe local injury to the wall of the vein. A patient from forty-five to sixty-five years old is most liable to thrombosis which suggests that the factor of age should be included in a consideration of causes.

Disorders of the venous return are of the greatest interest. They may be due to general circulatory failure to cardiac weakness plus venous stasis or to venous stasis alone. Since thrombosis occurs in a slow current these factors are obviously fundamental. Certain sitting or reclining postures or increased abdominal tension obviously aggravate this unfavorable influence. The anatomical relations of the upper femoral and iliac veins render these vessels

especially susceptible. Also in the upper calf and popliteal space there is an area somewhat like that of the groin where many currents meet. Many obscure thromboses undoubtedly originate there.

The writer comments upon the individual peculiarities of the varieties of thrombophlebitis. In phlegmasia alba dolens femoro-iliac thrombophlebitis or milk leg the obstruction commences in the upper femoral and external iliac vein. An interesting feature is the variation and severity of the initial pain. It is sometimes severe enough to suggest serious arterial ischemia. Such a state supports the hypothesis of a perivascular inflammation as the cause of the disease. A moderate fever and elevation of the pulse rate are very common. The elevation of the lower limbs above the level of the body for the purpose of drainage is essential. The affected leg should be exercised gently at the earliest possible moment. After edema has disappeared and the use of the limb is resumed a bandage is often required for some months.

Thrombosis in the calf muscles has been little described. As a rule the disease is very silent. The exciting cause is usually some minor injury or strain of the lower limb or foot. It is the impression of the author that this type is much more common than is generally supposed; it almost never merges into femoro-iliac thrombosis and it usually heals on proper treatment. He believes it is a relatively common source of pulmonary embolism. The unbandaged leg should be elevated on a soft pillow and after ten days exercised freely in bed. As function is gradually resumed a semi-elastic bandage is used.

Injuries and perhaps exposure to cold seem to be exciting causes of superficial thrombophlebitis in non-varicose veins. These disappear rapidly on elevation. Fatal embolism is rare from this type.

The author has observed infarctions from thrombophlebitis in varicose veins but no fatal embolism. If the process has reached the groin elevation of the leg is effectual. If high division of the saphenous vein above the thrombosed area can be accomplished the immediate cure is more rapid and a recur cure is forestalled. **HENRY F. THURSTON, M.D.**

BLOOD, TRANSFUSION

Durán Jordá F. Aleu E. M. Sardá Roca J. Benlloch Llorach A. Soteres Díez F. and Others. The Study of the Metabolism of Citrated Blood Conserved in Vitro (Contribución al estudio del metabolismo in vitro de la sangre citrada-conservada). *Rev. de sanidad de guerra* 1937 7 329 335 340 344 348 352 355

Durán Jordá and Aleu find that in from sixteen to twenty days conserved blood has destroyed one and one-half million of its erythrocytes. The white blood corpuscles are diminished by half in the same length of time. The hemoglobin value remains constant. It was found that glucose-citrated blood conserved the cellular elements much longer. It is possible that part of the slight shock reaction occasionally seen

from such an infection, the staphylococcic antitoxin level in the blood is greatly increased in comparison with normal individuals

The author divided his experimental series of cases into two groups. In the first group he used as specific antigen a purified toxoid of a minimum titer of 10 units, whereas in the second group he used a crude toxoid of the same titer. The antitoxin level in the blood serum was determined by the hemolytic method. The toxoid was administered subcutaneously every four days and the antitoxin level in the blood serum was determined before and two weeks after the last injection.

Marcialis found that in all children of his series the amount of antitoxin present in the serum was small, ranging from 0.20 to 0.50 antitoxic units per c cm of serum. Only in exceptional cases a titer of from 1 to 2 antitoxic units per c cm of serum was encountered.

Concerning the capacity of staphylococcic toxoid to increase the specific antitoxic level of the blood serum, Marcialis found that following doses of 0.20 c cm to 0.45 c cm of toxoid, the antitoxic level was increased up to about four times its original value. In one case this value was increased about ten times. In general, the author found a greater rise of the antitoxic level in children whose original titer was above 1 unit per c cm.

The author did not observe any marked difference in immunizing activity between the purified and the crude toxoid. He found that after three injections of the crude product, the antitoxic level in the blood was almost quantitatively identical with that obtained after three injections of the purified product.

Concerning the local and general reactions of staphylococcic toxoid, Marcialis found that the purified product may give rise to severe manifestations, which are presumably due to a specific allergic state of patients with a staphylococcic infection. It is believed that patients sensitized by staphylococcic toxin react more or less violently to the specific antigens present in the anatoxic filtrate. The author recommends, therefore, to begin the injections by using small doses, especially in potentially sensitized individuals.

In general the author found that the increase of the antitoxin level in the blood serum is not directly proportional to the injected quantity of toxoid but appears to be the resultant of a complex humoral-immune reaction produced by the specific antigen.

RICHARD E. SOMMA, M.D.

Penfold, W. J., and Tolhurst, J. C. • The Prophylaxis of Gas Gangrene in Man. *Med J Australia*, 1938, 1: 604.

About a year ago the authors described the immunization of animals with alum-precipitated formal toxoid made from bacillus-welchii toxin. Two injections of the toxoid given subcutaneously, with an interval of four weeks, protected guinea pigs against 10 minimum lethal doses of a living bacillus-welchii culture. The serum from immunized guinea

pigs was shown to have passive protective power in mice.

Stimulated by these results, the authors prepared a material apparently suitable for immunizing man against gas gangrene due to the bacillus welchii. The technique of production and administration is fully described.

It is not possible to state at the present time what level of antitoxin is fully protective, nor what is the best method of immunization, with regard to the size of the doses and the intervals between them. The duration of the immunity produced is, of course, not known as yet.

SAMUEL KAHN, M.D.

ANESTHESIA

Sise, L. F. • The Choice of Anesthesia for Surgery of the Upper Abdomen. *Am J Surg*, 1938, 39: 22.

For operations in the upper part of the abdomen, as elsewhere in the body, no one type of anesthesia should be used routinely. In each case, the agent and method which are best adapted to the particular conditions should be selected. In most instances spinal anesthesia with pontocaine or nupercaine is most satisfactory. An anesthetist well skilled in the administration and management of this anesthesia is absolutely essential. When a skilled anesthetist is not available, one of the various combinations of anesthetics, usually containing gas-ether as its principal constituent, given by the intratracheal route, is very satisfactory. When an experienced anesthetist is not available, ether is of great value since it is always obtainable, is of considerable immediate safety, and produces reasonable operating conditions. Regional anesthesia is usually unsatisfactory because of its limited field, but when patients are in poor condition it becomes the best possible choice for operations such as gastrectomy and cholecystostomy. The gases used alone are too weak to be at all satisfactory. Of the gases, cyclopropane is much the best. Nitrous oxide carries with it distinct possibilities of danger because of the poor operating conditions which it produces, and because the exclusion of oxygen may be carried too far.

J. THORNWELL WITHERSPOON, M.D.

Lowenberg, K., and Zbinden, T.: Destruction of the Cerebral Cortex Following Nitrous-Oxide-Oxygen Anesthesia. *Anes & Anal*, 1938, 17: 101.

An increasing number of reports on fatalities following nitrous-oxide-oxygen anesthesia have been published during the last few years. The authors report 6 new cases, 4 of which were fatal, 1 patient sustained a chronic injury to the brain, and 1 recovered.

The harmful effect of nitrous-oxide-oxygen anesthesia upon the brain may be due to two factors. (1) anoxemia due to the low oxygen content of the blood, and (2) the toxic effect of the gas.

Clinical and experimental observations do not support the view that anoxemia is the responsible fatal factor. The pathologico-anatomical findings

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

MacCollum D W The Lop Ear *J Am M Ass*
1938, 110 1427

The author reports the results in 21 cases of this particular ear deformity which were seen at the Childrens Hospital of Boston Massachusetts Of 180 000 children admitted to this institution 40 had deformities of the ear and 21 cases had lop ears or bat ears

The author believes that this deformity is definitely a congenital one and not acquired The external ear arises embryologically from 6 distinct tubercles Any one or more of these primordia may fail to develop resulting in a deformity of the ear The fetal ridge which is to form the helix appears during the third month and is gradually pushed upward and backward to form the outermost border of the ear If there is a delay in development during this third month the helix will remain in a forward position and continue its growth in a direction that is at a right angle rather than at a tangent to the head As the infant develops the conchal portion of the cartilage which at birth had an abnormal forward curvature continues to grow so that this forward curvature becomes more pronounced

Palliative measures are completely ineffectual As the deformity is a congenital overgrowth of the conchal cartilage it follows that to restore the ear to its normal contour the cartilage must be reduced in size Therefore the angle formed between the ear and the mastoid region must be reduced to at least 30 degrees The convolutions of the cartilages must be shaped to form an antihelix and a scapha both of which are absent in the lop ear The skin incision must be hidden behind the ear so that it is not readily noticeable Three methods of accomplishing these aims are described in detail

WILLIAM C BECK M D

Master A M Dack S and Jaffe H L Post operative Coronary Artery Occlusion *J Am M Ass* 1938 110 1415

The authors note that there has been little association observed between surgical operation and coronary occlusion Between the years of 1933 and 1937 615 attacks of coronary artery occlusion were treated in the Mount Sinai Hospital in New York Of these 35 or 5.6 per cent followed an operation in the hospital In 13 additional cases coronary occlusion was diagnosed by the surgeon but the e were not included because no post mortem or electrocardiographic findings confirmed such a diagnosis In most of the cases severe pain ordinarily associated with this condition was absent The condition must be especially differentiated from surgical shock and pulmonary embolism The latter differen

tiation may be impossible clinically or even electrocardiographically Two thirds of the patients were sixty years of age or more Men were affected about five times as frequently as women although the operations in the hospital were about evenly distributed between men and women In all but 3 of the cases there was evidence of moderate to severe previous coronary artery sclerosis Fifty-one per cent of the attacks occurred within the first three days after surgical operation Of the remaining 15 occurred prior to and a during the third week Although most of the operations were of major severity, it is found that coronary occlusion may follow any type of procedure even such minor ones as paravertebral block and drainage of a phlegmon The duration of the operation and the anesthesia did not seem to have any particular effect The question of the use of intravenous fluids was considered but only 10 of the patients were given fluid in this manner The length of pre-operative bedrest did not appear to be significant

Of the 35 patients 66 per cent died in 5 of the patients that died the diagnosis was made only at autopsy The authors believe that the evidence suggests that the operation precipitates the attack The manner in which the coronary attack would be precipitated by such a procedure was considered, but no definite conclusions were reached Slight shock as a factor might be discounted in that it was present in 60 per cent of the cases The authors conclude that patients over forty five years of age should be thoroughly examined and when coronary sclerosis is present the question of surgical intervention and the choice of surgical procedure should be given due consideration WILLIAM C BECK, M D

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Marcallis I Staphylococci Toxoid and Humoral Immunity (Anatossina stafilococcica ed immunizante) Policlin Rome 1935 43 ser med 15

After having briefly reviewed the literature on the biological properties of staphylococcus toxin and toxin Marcallis confirms experimentally the presence of a natural staphylococcal immunity in the child

Previous investigators have shown that in about two thirds of the children from two to twelve years of age the blood serum contains appreciable amounts of staphylococcal antitoxin varying from 0.20 to 3 antitoxic units per c cm of serum The titer increases during the first two years of life and reaches at about the age of even an average level of one antitoxic unit per c cm of serum About the same quantity is present in adults Other investigators have also shown that in individuals with an active staphylococcal infection or in those convalescing

The disadvantages of basal anesthesia are

1. The use of basal anesthesia involves the spending of a considerably longer period of time by the anesthetist on each case, and a long period of nursing care after the operation

2. The administration of the superimposed inhalation anesthetic is rendered more difficult by the previous administration of the basal anesthetic

3. A basal anesthetic, once administered, is uncontrollable

The drugs used for the production of basal anesthesia fall into three main groups. (1) avertin, (2) paraldehyde, and (3) barbiturates. The methods of administration, advantages, and contra-indications of each are discussed SAMUEL KAHN, M D

Binet, L., and Strumza, M. V.: *The Sensitivity to Anoxemia in General Anesthesia* (De la sensibilité à l'anoxémie au cours l'anesthésie générale) *Anes et Anal*, 1938, 4 41

Binet and Strumza report experiments on dogs to determine whether there is increased sensitivity to lack of oxygen in subjects under anesthesia. If such increased sensitivity exists, it indicates the need of supplying oxygen to patients when anesthetized.

In previous experiments with dogs anesthetized with chloralose given by injection and subjected to atmospheres low in oxygen, the authors found that respiration was arrested at atmospheric pressures corresponding to an altitude of 11,000 meters, or 4.69 per cent oxygen, shortly after the injection of chloralose. However, two hours or more after the injection, the animals could withstand atmospheres corresponding to altitudes of 13,000 meters and more, or 3.39 per cent and less of oxygen. In more recent experiments, it was found that dogs subjected to inspiration of an atmosphere corresponding to 13,000 meters, 3.39 per cent oxygen, ceased to breathe within a few minutes an hour or two after being anesthetized, but could be revived by the inhalation of oxygen. However, several hours later, when the chloralose was largely excreted, these animals were much more resistant to the diminished supply of oxygen. Repeated tests as the animals were recovering from the effect of the anesthetic showed that their resistance to the low oxygen content of the inspired air increased rapidly. However, if another small dose of chloralose was given, the respiration became slower and of diminished amplitude, and the resistance to the anoxemia again diminished.

In further experiments it was found that after section of the vagus nerve, the response of the animals under anesthesia to anoxemia was the same as in normal animals, and these animals showed the same increased resistance to anoxemia as the effect of the anesthetic wore off. This indicates that general anesthesia has a direct action on the respiratory center, rendering it less resistant to the effect of anoxemia.

In the discussion of this report, CORDIER states that his experiments with chloralose had given the

same results as those of Binet, but that experiments reported by others, with anesthesia produced by the injection of the barbiturates, showed that with these drugs respiration is maintained by a reflex excitation of the respiratory center by the resulting anoxemia, and the administration of oxygen has an unfavorable, rather than a favorable effect on the respiration.

ALICE M MEYERS

Woodbridge, P. D.: *Important Minor Points in Local Anesthesia*. *Canadian M Ass J.*, 1938, 38 216

As a foundation for a successful local anesthesia, the patient should be effectively narcotized. Morphine, or some other dependable pain relieving drug should be given in doses that are rather liberal as compared with those ordinarily used before spinal, ether, or cyclopropane anesthesia. On the other hand, the doses of drugs used to allay apprehension, such as scopolamine and the barbiturates, should be small. The doses of all drugs should be increased above the average for the youthful patient, for the unusually muscular and vigorous, and for those afflicted with fear, fever, or thyroid toxicity. The doses of drugs used should be decreased if the metabolic rate and reflex activity are low. This occurs in infancy and old age, in the presence of anemia, myxedema, prolonged invalidism, or weakness from any cause.

Metycaine seems to be superior to procaine (novocaine, neocaine), in that the anesthesia develops more rapidly, is more intense, and lasts longer. Furthermore, its toxicity clinically appears to be no greater than that of procaine. One-half per cent and occasionally 1 per cent solutions of either procaine or metycaine are used for local infiltration and field blocks. The solvent should be physiological saline solution. The solution should be warmed to body temperature.

One should differentiate between the toxic effects of the local anesthetic, on the one hand, and of the vasoconstrictor drug used, on the other. The gradual absorption of the local anesthetic causes a drop in the blood pressure, pallor and sweating, and, in severe cases, nausea, vomiting, and respiratory depression. The undesirable effects produced by epinephrine are different from the foregoing. A subjective sense of fear is probably the first effect to develop. Objectively, there develops a rise in the blood pressure and pulse rate, pallor, and a fibrillary tremor of the skeletal muscles. A feeling of constriction around the chest may be present. Further injection should be delayed until these signs and symptoms have subsided. This usually occurs in from twelve to fifteen minutes. It is likely that most cases of toxicity from local anesthesia are in reality not from the anesthetic drug but from excessive amounts of epinephrine in the solution. The toxicities of local anesthetics and of vasoconstrictor drugs are largely antagonistic. A careful balancing of the dosage might, therefore, balance the antagonistic actions. The amount that has proved satis-

point clearly toward the cause of the destruction of the brain tissue. These changes consist in a pronounced swelling of the brain as described by Reichardt. According to him brain swelling is an increase in the volume of the brain not produced by hyperemia or the accumulation of free fluid between the tissue structures such as edema, meningeal hydrops and hydrocephalus or by tumors or in inflammatory conditions but is caused by the retention of water by the cells and glial structures. Nitrous oxide is therefore, probably capable of directly influencing the metabolism of the nervous tissue and thereby causing the retention of water in its structures.

The destruction of the cerebrum due to nitrous oxide is never focal but is either laminar or diffuse. In patients surviving sixty hours the laminar type is predominant in patients dying during the anesthesia or from six to eight hours after it the changes are diffuse affecting with equal severity the neurones in all layers of the cortex. SAMUEL KAHN M.D.

Burford G. E. Pulmonary Complications After Cyclopropane. *J Am Med Ass* 1938 110 1087

The factors concerned in the production of post operative pulmonary complications are (1) the anesthetic agent including the technique of administration and recovery (2) the site of the operative procedure (3) the duration of the operation (4) the sex of the patient (5) the pre operative condition of the patient and (6) the depth of the anesthesia.

Burford reports on cyclopropane and its action on 3,333 patients in his own practice. Thirteen (0.97 per cent) of the patients developed pulmonary complications. The advantage of this anesthetic lies in its rapid elimination (hypoventilation consideration) and the reduced irritation in the respiratory tract (obstruction consideration). The routine administration of cyclopropane at St. Luke's Hospital in New York involved the regular addition of inert gas chiefly helium to the anesthetic mixture. The value of this technique lies in the prolonging of the absorption time of the gases in the hypoventilated or even completely static portions of the lung.

The important factor with regard to the operative procedure is the increased depth of the anesthesia that necessarily accompanies operation on abdominal areas.

The duration of operation in the 13 complicated cases in this series was an average of one hour and thirty-eight minutes. In only 1 of the 13 cases did complications develop after an operation lasting less than one hour.

There is no doubt that males show a greater pre disposition to pulmonary complications than females. It is also true that the administration of anesthetics to males is more difficult than to females. The metabolism in the male tissue is more active and produces on the average 40 calories per sq. m. of body surface per hour as compared with 37 calories for female tissue. Muscular action when once initiated is much more intense in males. This

results in subsequent derangement in the anesthetic atmosphere through losses and subsequent additions of the anesthetic and produces a too high concentration. This in turn leads to an uneven irregular induction. A heavily properly premedicated male is thought to be about equally as difficult as the average female. The author proposes to increase the preliminary medication of males enough to bring them to the operating room almost asleep with metabolic rates greatly depressed and as nearly as possible insusceptible to the stimuli of their surroundings, the medication being given far enough ahead (for instance one and one-half hours for morphine) to have reached its maximum effect before the anesthesia is started and to be wearing off as the anesthesia progresses. He further proposes to use cyclopropane the rapid induction of which when desired, takes effect with a minimal amount of stimulation muscular activity and subsequent metabolic elevation.

It has long been observed that elderly debilitated septic or acutely ill patients are more prone to postoperative complications. In this series however no marked confirmation of these facts was apparent.

With regard to the depth of anesthesia the contrast in this series between the incidence of pulmonary complications developing after abdominal operations and after non abdominal operations is interesting. There were 626 abdominal operations with pulmonary complications in 3.07 per cent and 707 non abdominal operations with no postoperative pulmonary complications. J. DANIEL WILLIAMS M.D.

Ashworth H. K. Basal Anesthesia. *Practitioner* 1938 140 233

Basal anesthesia aims at the comfortable production of unconsciousness and a sufficient depth of narcosis to enable subsequent surgical anesthesia to be obtained and maintained by the superimposition of nitrous oxide and oxygen or a small amount of ether or chloroform. No basal anesthetic should be used in doses sufficiently large to produce full surgical anesthesia without the need of any additional inhalational or other anesthetic.

The advantages of basal anesthesia are:

1. It has a beneficial psychic effect on the patient pre-anesthetic apprehension is minimized.
2. Full surgical anesthesia can be maintained often with the use of gas and oxygen alone. If ether or chloroform is necessary small amounts usually suffice.
3. The postoperative period is one of greater comfort and well being for the patient.
4. The patient is not subjected to the harmful biochemical changes produced by the administration of ether or chloroform in large quantity or to the strain thrown upon the liver and kidneys in excreting the drugs.
5. Postoperative vomiting is usually slight.
6. Postoperative respiratory complications are reduced.

X-RAY TREATMENT OF INFECTIONS

Collective Review

M. LOWRY ALLEN, M D, Philadelphia, Pennsylvania

WITHIN the past few years the value of roentgen therapy in the treatment of acute and chronic infections has been thoroughly proved and established. At present it is recognized as a potent ally of the physician and surgeon in the successful management of various types of inflammatory conditions. Despite the experimental observations of Schaefer (26), Motojima (19), and Lacassagne and Vinzent (13), and the clinical testimony of Coyle (1), Dunham (4), Ross (25), Hodges (7), Heidenham and Fried (6), Pordes (21), Manges (17), and many others, this mode of therapy has not been accorded the widespread use which the treatment merits. This is due to several factors, among which may be cited the skepticism of the profession as to the curative value of a mode of therapy which has claimed to be effective in a multiplicity of infectious states, the disbelief aroused by the varied explanations of the favorable mode of action of irradiation on inflammatory lesions, the fear that its use might result in permanent skin damage, and the rather generalized lack of knowledge among physicians regarding the favorable action of irradiation on acute and chronic infections.

The first use of roentgen rays in the treatment of inflammatory processes goes back to 1902 when it was observed that certain types of infections seemed to improve following the exposure of the affected part to roentgen rays for purposes of diagnosis. This observation prompted the idea, long since discarded, that the roentgen rays possessed distinct bactericidal properties. Then followed numerous and exhaustive studies of the action of the rays on living tissues and cellular elements, which resulted in the present well-grounded concept of the mechanism through which irradiation operates in various pathological states.

Desjardins (3), in a comprehensive explanation of the mechanism by which irradiation operates in cases of acute and chronic infection, says, "Anyone who has had extended experience with radiotherapy for acute inflammations cannot fail to have been impressed by the prompt relief of pain and rapid resolution of lesions when treated early, or acceleration of suppuration in lesions

treated later, by the fact that acute inflammations of various kinds respond at about the same rate to a given dose when treated at a corresponding stage, and by the fact that a small dose of rays is sufficient to produce this effect." He argues that since irradiation acts in the same way and on so many forms of acute inflammations, it would seem logical to conclude that the lesions themselves must have some common factor. This factor would seem to be the radiosensitiveness of certain cells which is more or less a prominent feature of the majority of the acute inflammations. In considering pyogenic infections Desjardins points out that these in general are characterized by varying degrees of leucocytic infiltration leucocytes, chiefly lymphocytes, polymorphonuclear cells, and eosinophils accumulating around one or more clusters of bacteria. This leucocytic regimentation appears to be nature's method of intensifying the production of antibodies. Hyperemia is an additional factor which facilitates the mobilization and regimentation of the leucocytes. In certain acute inflammations, particularly those caused by streptococci, local leucocytic infiltration is not a prominent feature. Against infections of this kind the body apparently defends itself by a general reaction of the leucocytes in the circulating blood. Experiments on animals and human beings have shown that each type of cell has a specific degree of sensitiveness to irradiation, some being extremely sensitive to small doses, while others are not influenced by doses many times larger. The most sensitive of all the cells are manifested in the spleen, lymph nodes, lymph follicles, thymus gland, circulating blood, and bone marrow. The polymorphonuclear and eosinophil leucocytes are also sensitive but their susceptibility to irradiation is less than that of lymphocytes. Warthin (28) found experimentally that lymphocytes were destroyed in fifteen minutes following irradiation.

In circumscribed inflammations the rays act mainly by destroying a portion of the lymphocytes infiltrating the lesion or circulating in the blood vessels which supply the affected area. This disintegration of the infiltrating leucocytes results in the liberation of the antibodies, ferments, and other protective substances contained in these

factory is 0.2 mgm. of epinephrine, or 0.2 c cm. of a 1 to 1,000 solution, for each gram of the anesthetic drug. One gram of the anesthetic is the amount contained in 100 c cm. of a 1 per cent solution. This proportion corresponds roughly to one minim per ounce of a 1 per cent solution.

It is evident that no dogmatic answer can be given to the question as to the total amount of solution that can be safely used. The anesthetist should always be on the lookout for signs of toxicity and should not inject more than 80 c cm. of a 1 per cent solution without a pause of ten minutes to allow signs of toxicity to develop.

The syringe should be of glass so that aspirated blood can be seen. A capacity of 10 c cm. is convenient. The nipple should be eccentric so that needles may lie immediately beneath the skin throughout their full length without being bent.

There are several points of technique that are often neglected in the many types of injection.

If skin wheals are to be made less painfully, the needle should be held with the bevel facing down rather than up.

The forefinger of the left hand serves as a very helpful guide during subcutaneous injection. It palpates the skin just ahead of the point of the needle, senses just how deep the point is, and depresses either the point of the needle or the skin ahead of the needle to keep the point at just the right depth.

To avoid intravascular injection of a considerable amount of solution, either the needle should be kept

moving or frequent aspiration should be made. No more than 1 c cm. of a 1 per cent solution should be injected with the needle stationary unless the aspiration test is performed.

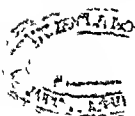
As a precaution against breaking needles they should not be curved but should be kept straight whenever possible. For subcutaneous injection in a concave area the skin should be pulled up into a straight line so as to conform to the straight shaft of the needle.

For field block of superficial lesions an equilateral quadrangle of subcutaneous injections may be made around the lesion and the needle may then be inserted through the wheel at each corner of the quadrangle and slanted towards a point directly underneath the center of the lesion. In this way a cone shaped wall of solution may be deposited under and around the lesion.

For abdominal field block the location of the wall of anesthetic solution will depend on the site of the proposed incision.

Honesty must be the rule in deciding whether an injection has really produced anesthesia. When anesthesia does not follow the injection of the solution other methods should be employed. The best local anesthesia may be rendered futile if the surgeon uses a technique adapted only to spinal or deep general anesthesia. Only those surgeons who are willing to adopt the necessary gentleness and nicety of technique that is required by local anesthesia should attempt to work with it.

DANIEL LARSEN, M.D.



X-RAY TREATMENT OF INFECTIONS

Collective Review

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WITHIN the past few years the value of roentgen therapy in the treatment of acute and chronic infections has been thoroughly proved and established. At present it is recognized as a potent ally of the physician and surgeon in the successful management of various types of inflammatory conditions. Despite the experimental observations of Schaefer (26), Motojima (19), and Lacassagne and Vinzent (13), and the clinical testimony of Coyle (1), Dunham (4), Ross (25), Hodges (7), Heidenham and Fried (6), Pordes (21), Manges (17), and many others, this mode of therapy has not been accorded the widespread use which the treatment merits. This is due to several factors, among which may be cited the skepticism of the profession as to the curative value of a mode of therapy which has claimed to be effective in a multiplicity of infectious states; the disbelief aroused by the varied explanations of the favorable mode of action of irradiation on inflammatory lesions, the fear that its use might result in permanent skin damage, and the rather generalized lack of knowledge among physicians regarding the favorable action of irradiation on acute and chronic infections.

The first use of roentgen rays in the treatment of inflammatory processes goes back to 1902 when it was observed that certain types of infections seemed to improve following the exposure of the affected part to roentgen rays for purposes of diagnosis. This observation prompted the idea, long since discarded, that the roentgen rays possessed distinct bactericidal properties. Then followed numerous and exhaustive studies of the action of the rays on living tissues and cellular elements, which resulted in the present well-grounded concept of the mechanism through which irradiation operates in various pathological states.

Desjardins (3), in a comprehensive explanation of the mechanism by which irradiation operates in cases of acute and chronic infection, says, "Anyone who has had extended experience with radiotherapy for acute inflammations cannot fail to have been impressed by the prompt relief of pain and rapid resolution of lesions when treated early, or acceleration of suppuration in lesions

treated later, by the fact that acute inflammations of various kinds respond at about the same rate to a given dose when treated at a corresponding stage, and by the fact that a small dose of rays is sufficient to produce this effect." He argues that since irradiation acts in the same way and on so many forms of acute inflammations, it would seem logical to conclude that the lesions themselves must have some common factor. This factor would seem to be the radiosensitivity of certain cells which is more or less a prominent feature of the majority of the acute inflammations. In considering pyogenic infections Desjardins points out that these in general are characterized by varying degrees of leucocytic infiltration: leucocytes, chiefly lymphocytes, polymorphonuclear cells, and eosinophils accumulating around one or more clusters of bacteria. This leucocytic regimentation appears to be nature's method of intensifying the production of antibodies. Hyperemia is an additional factor which facilitates the mobilization and regimentation of the leucocytes. In certain acute inflammations, particularly those caused by streptococci, local leucocytic infiltration is not a prominent feature. Against infections of this kind the body apparently defends itself by a general reaction of the leucocytes in the circulating blood. Experiments on animals and human beings have shown that each type of cell has a specific degree of sensitivity to irradiation, some being extremely sensitive to small doses, while others are not influenced by doses many times larger. The most sensitive of all the cells are manifested in the spleen, lymph nodes, lymph follicles, thymus gland, circulating blood, and bone marrow. The polymorphonuclear and eosinophil leucocytes are also sensitive but their susceptibility to irradiation is less than that of lymphocytes. Warthin (28) found experimentally that lymphocytes were destroyed in fifteen minutes following irradiation.

In circumscribed inflammations the rays act mainly by destroying a portion of the lymphocytes infiltrating the lesion or circulating in the blood vessels which supply the affected area. This disintegration of the infiltrating leucocytes results in the liberation of the antibodies, ferments, and other protective substances contained in these

factory is 0.2 mgm of epinephrine or 0.2 c cm of a 1 to 1000 solution for each gram of the anesthetic drug. One gram of the anesthetic is the amount contained in 100 c cm of a 1 per cent solution. This proportion corresponds roughly to one minim per ounce of a 1 per cent solution.

It is evident that no dogmatic answer can be given to the question as to the total amount of solution that can be safely used. The anesthetist should always be on the lookout for signs of toxicity and should not inject more than 80 c cm of a 1 per cent solution without a pause of ten minutes to allow signs of toxicity to develop.

The syringe should be of glass so that aspirated blood can be seen. A capacity of 10 c cm is convenient. The nipple should be excentric so that needles may lie immediately beneath the skin throughout their full length without being bent.

There are several points of technique that are often neglected in the many types of injection.

If skin wheals are to be made less painfully, the needle should be held with the bevel facing down rather than up.

The forefinger of the left hand serves as a very helpful guide during subcutaneous injection. It palpates the skin just ahead of the point of the needle, senses just how deep the point is, and depresses either the point of the needle or the skin ahead of the needle to keep the point at just the right depth.

To avoid intravascular injection of a considerable amount of solution, either the needle should be kept

moving or frequent aspiration should be made. Not more than 1 c cm of a 1 per cent solution should be injected with the needle stationary unless the aspiration test is performed.

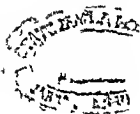
As a precaution against breaking needles they should not be curved but should be kept straight whenever possible. For subcutaneous injection in a concave area the skin should be pulled up into a straight line so as to conform to the straight shaft of the needle.

For field block of superficial lesions an equilateral quadrangle of subcutaneous injections may be made around the lesion, and the needle may then be inserted through the wheel at each corner of the quadrangle and slanted towards a point directly underneath the center of the lesion. In this way a cone shaped wall of solution may be deposited under and around the lesion.

For abdominal field block the location of the wall of anesthetic solution will depend on the site of the proposed incision.

Honesty must be the rule in deciding whether an injection has really produced anesthesia. When anesthesia does not follow the injection of the solution other methods should be employed. The best local anesthesia may be rendered futile if the surgeon uses a technique adapted only to spinal or deep general anesthesia. Only those surgeons who are willing to adopt the necessary gentleness and nicety of technique that is required by local anesthesia should attempt to work with it.

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and cellular tissue, respond well to doses of from 700 to 900 roentgen units of unfiltered irradiation. Following this the lesions gradually regress and disappear in from two to four weeks. Cellulitis and lymphangitis of certain types are particularly amenable to small doses of from 100 to 150 roentgen units of unfiltered rays. In Mikulicz's disease larger doses than ordinarily required by other inflammatory processes are given owing to the production of connective tissue and the lymphocytic infiltration characterizing this condition. The most effective dose consists of 400 roentgen units with 200 kv., and a filtration of 1 mm of copper and 1 mm. of aluminum. Postoperative parotitis, which normally has a mortality rate of from 35 to 60 per cent, may show a markedly lowered rate if the irradiation therapy is given early. At the same time the percentage of such cases going on to suppuration is markedly decreased. In infected rhinophyma, roentgen therapy is the treatment of choice because of the pathological nature of the lesion which makes it difficult to treat it by any other method. Such lesions usually respond to a dose of 300 roentgen units of filtered rays. There is a prompt regression of the lesion and the final result is a nose of normal appearance, exhibiting little or no telangiectatic elements and a smooth, natural skin.

In the roentgen treatment of carbuncles, which the authors classify in Group 2, surgical and other measures are usually also required. Irradiation alone in these cases usually limits the spread of the infection, shortens the course of the disease, and probably lowers the mortality. If treated early, carbuncles can often be completely aborted following a single treatment. In the later stages, repeated treatments with small doses of unfiltered rays may be necessary. Blastomycosis and sporotrichosis respond favorably to irradiation. These are best treated by the application of from 500 to 700 roentgen units of filtered rays. Irradiation in these cases is supplemented by iodine therapy. Every infection, whether it appears trivial and unimportant or localized and delimited in the beginning, is a harbinger of potential sequelae such as thrombophlebitis, lymphangitis, and pyemia. Irradiation plays an important rôle in the prevention of the development of these complicating factors. Each case of infection should be individualized and treated accordingly. The interval between treatments is determined by the reaction of the lesion. Hot dressings, if employed in conjunction with roentgen therapy, should be confined merely to the site of the lesion and not applied to the surrounding tissues. General supportive measures should also be utilized in

the successful management of these conditions, and the close co-operation of the radiologist, surgeon, and internist should prevail at all times.

Manges (17) speaks of the value of roentgen therapy in the treatment of furuncles, carbuncles (especially those of the face), paronychia, felon, abscess, erysipelas, cellulitis, lymphangitis, pelvic infection in the female, cystitis, periproctitis, parotitis, acute sinus and mastoid infection, gas bacillus infection, postoperative wound inflammations and infections, unresolved pneumonia, and lobar pneumonia when treated early. The optimum time for the treatment of these conditions is when the first definite evidence of infection is established with pain, swelling, redness, tenderness, fever, leucocytosis, lymphangitis, and adenitis. In other words, the inflammatory process must be established before irradiation is effective. If the treatment is given in this early stage of such infections, a large percentage of the suppurative lesions disappear without going on to suppuration. One of the most remarkable clinical observations is that many of the most toxic patients, following treatment with roentgen therapy, experience a real sense of relief with a prompt amelioration of many of the symptoms. If treatment is given after localized infections go on to suppuration, the latter process is accelerated, which results in better localization and prompt pointing of the suppuration. Some of the rules covering irradiation therapy are: the treatment should be limited to the area of disease, the dose in acute stages, with a few exceptions in the later stages of superficial infections, should never exceed from 10 to 20 per cent of a skin erythema dose, or from 60 to 120 roentgen units; relatively low voltage of from 80 to 135 kv. should be employed with unfiltered or light filtration; deeper lesions, such as felons and carbuncles, require higher filtration, up to 4 mm. of aluminum. With deep-seated or massive lesions, deep therapy is employed with a voltage of 200 kv. and a filtration of $\frac{1}{2}$ mm of copper and 1 mm of aluminum. The dosage of such cases should be limited to from 10 to 20 per cent of a skin erythema dose.

Hodges (9) states that one of the most useful applications of the roentgen ray in the treatment of potentially serious infections is in the treatment of those apparently more or less insignificant lesions which occur on the upper lip, around or within the nose, around the eyes, and to a lesser extent on the extremities. In these cases the primary portal of entry is frequently no more than a slight abrasion, a cut, a bruise, or a pimple. If the infection in such cases is of sufficient virulence there is a rapid lymphangitis and thrombo-

cells. These liberated substances become mixed with the tissue fluids in the surrounding tissue spaces. The protective substances thus liberated are more readily available for defensive purposes than when contained in the original intact white blood cells. At the same time there is an increase in phagocytosis by the reticular cells, which become macrophages. This cellular destruction and increased phagocytosis represent the effect on the body to exposure to the roentgen rays in localized pyogenic infections and probably explains the universal favorable action of these agents. This view is further supported by the clinical circumstances which indicate that inflammatory lesions respond to irradiation in proportion to the degree of leucocytic infiltration. Other supportive evidence is the fact that radiotherapy is most beneficial during the infiltrative stage of such infections and less beneficial during the suppurative stage. That there is a variation in the degree of leucocytic infiltration of different lesions of the same character or of similar lesions of different character is a well known pathological fact and probably explains why some lesions respond more readily to irradiation than others. In inflammations that are not circumscribed and in which leucocytic infiltration is comparatively slight, the affected area is hyperemic and the vessels are more or less engorged with blood. Wide exposure of such an area to small doses of irradiation undoubtedly causes the disintegration of many leucocytes and the contents of the destroyed cells are liberated into the blood and throughout the tissue spaces. This makes possible a biological defensive reaction similar to that described in more limited inflammations.

In discussing the effects of irradiation on chronic inflammations Desjardins points out that such lesions are characterized by varying degrees of leucocytic infiltration, connective tissue proliferation, and caseous or calcareous degeneration. In view of this fact the clinical effect of irradiation in such conditions is slow and maximal improvement or cure is obtained only after repeated treatments at varying intervals. While the leucocytic infiltration in such chronic lesions is readily susceptible to destruction or diminution from exposure to the roentgen rays, the connective tissue elements are comparatively resistant to such exposure. Hence the greater the degree of leucocytic infiltration in proportion to the connective tissue proliferation, the more marked and more rapid is the influence of the treatment. This is well exemplified in the treatment of tuberculous lesions in which it has been found that the effect of irradiation is greater during the infiltrative

phase of the tubercles, when leucocytic infiltration is most pronounced, than it is when the leucocytic infiltration has diminished and the lesion has passed into the advanced stage of caseous degeneration or repair with connective tissue or by calcification. This conclusion is in complete agreement with the experimental evidence and all of the clinical observations that have been recorded.

Hodges and Berger (10), citing their experiences and observations in the irradiation therapy of infections over a period of seventeen years have classified the lesions into two groups in accordance with the susceptibility to irradiation. Group 1 comprises early localized erysipelas in adults, furuncles and furunculosis, granulomas, infected hemangiomas, cellulitis of certain types, lymphangitis of certain types, Mikulicz's disease, parotitis, and rhinophyma. Group 2 comprises carbuncles, blastomycosis and sporotrichosis. The writers feel that all of the infections listed in Group 1 are amenable to x-ray therapy to such a degree that no other form of therapeutics is necessary in their treatment. The lesions listed in Group 2, however, are of such a nature that irradiation is the important auxiliary in the management of these conditions. In the treatment of erysipelas, particularly the early localized form in adults, irradiation therapy may be considered as a specific. Small early lesions so treated disappear within twenty-four hours and require no further therapy. The temperature and toxicity in such cases are rapidly alleviated and the edema and erythema quickly subside, and leave a wrinkled and exfoliated skin in from thirty-six to forty-eight hours. The dose required is from 200 to 150 roentgen units (measured in air) of unfiltered irradiation with a voltage of approximately 8 kV. This dose should be administered well beyond the apparent borders of the lesion in order to prevent further streptococcal permeation of the corium. Furuncles and furunculosis likewise respond favorably to irradiation therapy. If treated early such lesions may be completely aborted in from twelve to twenty-four hours following the administration of a small dose of unfiltered rays. If more advanced lesions are similarly treated, suppuration will be hastened. Chronic furunculosis in which the pathological condition extends deeper into the skin with more connective tissue involvement, is best treated by the use of more heavily filtered rays. The dose in such cases is 125 roentgen units filtered through 6 mm. of aluminum with 125 kV and it is repeated several times at weekly intervals. Infected angiomas and granulomas with their abundant overgrowth of vascular

of the disease. In the cases successfully treated with irradiation, lactation soon returned to normal and was fully preserved during the entire lactation period.

Powell (22) reports on the treatment of 47 cases of lobar pneumonia with irradiation therapy. Treatment in these patients was started in all stages of the disease and without regard to the type of the causative organism. None of the patients received serum therapy, although the customary routine supportive treatment was given in addition to the irradiation. The factors used were 150 kv with a filtration of 3 mm of aluminum, and 250 roentgen units were given at one time over the involved lung. When the patients did not respond to such treatment a second dose was given within from twenty-four to forty-eight hours. Comparing the results obtained in this series of cases with the results in a series of 76 patients treated without irradiation, the author made the observations that the irradiated patients seemed to be made more comfortable, many had their crises during the twenty-four hours following their first irradiation, a larger percentage of the irradiated patients recovered by lysis than did those treated by other methods, a lowered mortality rate obtained in those receiving irradiation therapy, and complications were fewer in this group of patients. The early crisis following irradiation is thought to be due to the destruction of the lymphocytic infiltration in the affected lung, which releases a specific lysin and causes a rapid solution of the coagulum, which is the principal component of the pneumonic consolidation.

Feinstein and Poppe (5) treated 30 patients with lung abscess with irradiation therapy. In 17 of these patients the condition developed following pneumonia and in 10 after influenza. Twenty-five of the cases were uncomplicated by gangrene. Recovery occurred in 22 of the 25 uncomplicated cases, while improvement was noted in the other 3. None of the 25 patients developed any sort of a complication or relapse. Following irradiation, improvement in the patient's general condition was usually noted, sometimes as early as after the first treatment. The factors employed were 150 kv, 3 ma, 0.5 mm of copper plus 1 mm of aluminum filter, and 30 cm skin target distance, and from 20 to 25 per cent of a skin erythema dose was given at one sitting. No patient received more than a total of 5 treatments. The authors believe that roentgen therapy yields the highest percentage of cures and the most lasting results in recent cases of lung abscess as compared with all other methods of

treatment. In chronic lung abscess the results obtained from roentgen-ray therapy were good also, but the irradiation must be repeated.

Lattman (14) employed roentgen therapy in the treatment of 20 cases of subacromial bursitis. In 15 of the patients the pain was relieved from twenty-four to forty-eight hours after the first treatment, and there was also a marked increase in the motion of the arm in each case. The treatment given consisted in the application of 350 roentgen units, using the following factors: 200 kv., 0.25 mm of copper filter, 50 cm skin target distance, and one anterior and one posterior field over the affected shoulder. In most cases only one treatment was necessary to relieve the patient completely of pain and restore freedom of motion. The author believes that irradiation treatment enables the patient to resume his normal routine more quickly than any other form of treatment in this disabling condition.

Schenck (27) administered irradiation therapy to 105 children suffering from acute cervical adenitis. Of these patients 85.7 per cent were cured without ensuing suppuration, while in the remaining 14.3 per cent the glandular lesion terminated in pus formation. In all but 5 of the patients the adenitis was secondary to an infection of the upper respiratory tract. In the patients who were classed as cured, all subjective symptoms were relieved in forty-eight hours and the temperature returned to normal, while the glandular swelling subsided within one week. The earlier the treatment was given in the course of the disease, the better the response to the roentgen therapy. The dosage used consisted of from 10 to 20 per cent of a skin erythema dose, the treatment being administered at intervals of every other day until a favorable response was secured. Schenck expressed the belief that roentgen therapy is the treatment of choice for acute cervical adenitis and should be so recognized.

Pfahler and Kapo (20) analyzed the results obtained from the roentgen treatment of 333 cases of acute and chronic cervical adenitis. In 133 of these cases a clinical diagnosis of tuberculosis was made. In 22 the diagnosis was confirmed by biopsy. Of the total number of patients 184 were females and 149 males. The youngest patient treated was two weeks of age and the oldest sixty years. One hundred and fifty-nine of the 333 patients returned for observation, from which it was shown that 152 patients were cured or partially cured while only 7 patients did not show improvement. The factors used in the treatment of these patients were as follows: 130 kv.; 5 ma.; 40 cm. skin target distance, 6 mm. of aluminum

phlebitis, and if the infection is not halted a fatal sinus thrombosis or other intracranial complication frequently results. These facial lesions should be submitted to x ray therapy as early as possible in order to prevent the occurrence of the foregoing complications. A small dose of from 100 to 150 roentgen units of unfiltered, low voltage rays should be applied. This causes a rapid walling off of the infection within a few hours. In infections of this type, which are due to the hemolytic streptococcus antistreptococcic serum and blood transfusions from an immunized donor should be employed. Insignificant and potentially serious infections of this nature which occur on the extremities, particularly the feet, should also be submitted early to irradiation therapy, owing to the liability of such infections to cause a generalized septicemia.

Knaupfer and Hummel (12) report their treatment of 49 cases of postoperative parotitis with irradiation therapy. As controls the records of 22 cases treated in the usual manner without irradiation were used for comparison. The factors used were 100 kv, 3.5 ma, 0.5 mm of copper plus 3 mm of aluminum filter, with a dosage of from 150 to 200 roentgen units. This amount of treatment was repeated once or twice at two-day intervals. Most favorable results were obtained in those cases treated early after the appearance of the parotitis. The later the application of the irradiation the more often was it impossible to avoid the need for surgical intervention. However, favorable results were obtained in those cases in which suppurative softening supervened. In most all of the irradiated cases the patients experienced a reduction in temperature and a general improvement in their clinical condition. At the same time it was noted that the hospital stay was shorter in the irradiated group of patients than in those treated with the usual methods.

Robinson and Spencer (24) treated 12 patients with postoperative parotitis with irradiation, using highly filtered high voltage rays. Three hundred roentgen units were administered at one sitting to the involved side or if the process was bilateral to both sides. The parotitis in all of these cases occurred following laparotomy. There were 3 deaths in the series of cases treated, which represent a distinct decrease in the mortality generally encountered in these cases when ordinary methods of treatment are used. When irradiation is given early in postoperative parotitis the inflammatory process is aborted or results in early localization.

Kelly and Dowell (11) report the results of irradiation therapy in the treatment of 56 cases of

gas gangrene. In 44 of these cases the infection was confined to an extremity. The mortality rate in this series of cases was 8.9 per cent, which figure compares favorably with any series of cases of gas bacillus infection so far reported in the literature. The technique of treatment recommended by the authors is the wide exposure of the affected part to the rays twice daily until there is a distinct regression of the lesion. One hundred roentgen units are given at each treatment over each area with a filtration of 1 mm of aluminum, if the infection is confined to an extremity and heavier filtration and higher voltage, if the process involves the trunk. Amputation seems to be an unnecessary therapeutic procedure, as there were 12 patients who did not undergo amputation and all of them recovered. Despite the efficacy of irradiation in this series of cases, the use of serum should not be abandoned; however, some of these cases received no serum therapy. The use of tetanus antitoxin is likewise advocated. The best results were obtained when the irradiation therapy was instituted early.

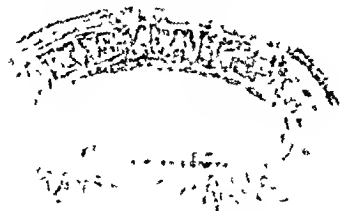
Margraf (18) treated 118 cases of puerperal mastitis with irradiation therapy, and compared the results obtained with the results in a series of 117 cases which were treated with more conservative methods. The technique used consisted in the employment of rays generated at 27 kv, using 4 ma and filtered through 0.5 mm of copper and 1 mm of aluminum. A dose of 115 roentgen units of such rays was given over the affected breast. If pain and fever did not properly disappear a second treatment was given after forty-eight hours, followed by a third treatment if necessary after ninety-six hours. Before treatment the breast was pumped empty and afterward elevated by bandages. Wet alcohol dressings were occasionally used. Direct nursing of the breast was not permitted during the course of roentgen therapy. When only one or two irradiation treatments were needed the inflammatory process quickly resolved in 61 per cent of the cases while 33 per cent of the cases requiring three treatments showed resolution. The best results were obtained when the roentgen therapy was instituted early in the course of the disease or with the first appearance of pain, swelling, fever and leucocytosis. Of 71 cases in which the treatment was started within twenty-four hours 92 per cent had spontaneous healing as compared with 71 per cent of the 127 non irradiated cases and with 81 per cent of the cases in which irradiation therapy was started after the lapse of twenty-four hours. If surgical measures became necessary, irradiation did not seem to shorten the duration

in the body, particularly the acute variety, irradiation treatment is at least worthy of a trial. In infections around the face, in early localized erysipelas, in furuncles, in granulomas and infected hemangiomas, in parotitis, and in certain types of cellulitis and lymphangitis, roentgen-ray therapy should be regarded as the treatment of choice. It offers much in the way of lowering the mortality rate in pneumonia. All of those familiar with its use emphasize its curative and healing properties when it is applied early in the course of the infection. With this thought in mind it should not be prescribed merely as a last resort after all other remedies have been tried and found wanting. The logical time to employ this valuable adjunct in combating infection is when hyperemia, leucocytic infiltration, and other inflammatory phenomena are beginning to appear. At this time the infection itself is not well established and hence an added reinforcement of the body's defense mechanism by means of irradiation therapy may abort the inflammatory process by overwhelming the invading micro-organisms. To secure such a happy result calls for close cooperation between the surgeon or physician and the radiologist, as only this will lead to the best results that can be expected. In the hands of the skilled radiologist such a form of therapy is harmless to the patient, and no untoward effects have resulted from its use. With the almost universal adoption of the "r unit" as a measure of quantity of radiation and a better understanding of the proper choice of filters, it is now possible to duplicate the doses of irradiation which have been found to constitute the optimum in various inflammatory conditions. With a better appreciation of its merits on the part of the medical pro-

fession, and its more universal administration by radiologists in general, roentgen-ray therapy will rightfully take its place as one of the first-line measures of defense in the proper treatment of infections.

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filter, and a dosage of 300 roentgen units which was administered at intervals of from one to two weeks until the desired results were obtained. No more than 10 treatments were given to any 1 patient while the average number of treatments given was from 2 to 4. Those patients with old sinuses and scars resulting from previous attacks of the adenitis were treated by electrothermic destruction followed by irradiation. The authors warn against the production of atrophy and telangiectasis of the skin over the treated areas when too large doses are applied or when the total dosage employed exceeds the known margin of safety.

Rathbone (3) cites his results in treating 70 cases of sinus disease in children with roentgen therapy. All of these patients had roentgen examination of their sinuses before and after treatment and were followed over a period of from one to three and one half years. In this group 57 per cent were cured, 18 per cent showed improvement, and 15 per cent were not benefited by the treatment. The criterion of cure was a complete disappearance of all evidence of sinus disease from a clinical and roentgen standpoint. The patients receiving the most benefit from roentgen therapy were the children with a diffuse lymphoid hyperplasia throughout the nose and throat, accompanied with a watery or mucous nasal discharge, a history of frequent colds, a chronic cough, and a roentgen demonstration of hyperplasia of the mucous-membrane lining of the antra or ethmoids. After roentgen therapy it was found that these children had fewer colds and the sinuses were rarely ever again involved. Two techniques were employed in the treatment of this series of patients. One consisted of a peak voltage of 125 kv, 5 ma, 12 inches skin target distance, 5 mm of aluminum filtration and a dose of 120 roentgens (measured in air). The other technique consisted of a peak voltage of 220 kv, 20 ma, 50 cm. skin target distance, 0.15 mm of copper filtration and a dose of 100 roentgens (measured in air). Three fields were used, one anterior and a right and left lateral. The eyes and eyebrows were protected with lead shields. A total of 6 treatments was the usual routine, the treatments being given 3 times a week over a two-week period. Such treatment was found to be absolutely harmless and without any immediate or late ill effects.

Daniel (2) reports good results from the irradiation treatment of early cases of acute otitis media, resolution of the process occurring without suppuration when the treatment was applied within the first twenty four hours. A dosage of from 20 to 50 roentgen units was applied over the

affected ear. When suppuration had occurred, irradiation should be used with caution except when surgical drainage is provided. Similar good results were obtained following irradiation in early cases of acute sinusitis and mastoiditis.

Luciman (16) in his office practice treated 50 consecutive cases of otitis media with irradiation therapy. Thirty-one of the patients were in the acute stage of the disease, 8 were in the subacute stage and 11 were in the chronic stage. In practically all of the patients the initial treatment was followed by prompt relief of the pain and increased discharge, improved hearing, and amelioration of the systemic manifestations of the disease. None of the patients in the acute stage which were treated in this manner developed mastoiditis or perforation of the tympanic membrane and none of them required tympanotomy. In 9 cases mastoiditis was already present when the treatment was instituted, and 2 of these later required mastoidectomy. In the chronic cases of otitis media the symptoms of persistent aural discharge, pain, tinnitus, and deafness were either diminished or eradicated, and the healing of perforated tympanic membranes seemed to be accelerated. The factors used were from 100 to 110 kv, 16 inch skin target distance, 2 mm aluminum filter, 5 ma, and a dosage of 75.5 roentgen units. The treatments were administered at three-day intervals and in the acute cases no more than 3 treatments were required. In the chronic cases the treatments were given at weekly intervals. In a controlled series of 25 unselected cases of acute and chronic otitis media in which roentgen therapy was not applied, perforation of the tympanic membrane occurred in 3, mastoiditis developed in 9, mastoidectomy had to be done in 3, and tympanotomy was done in 11. Luciman concludes that roentgen therapy, when properly applied is the treatment of choice in both acute and chronic otitis media as it shortens the course of the disease and prevents ensuing complications.

Levin (15) reports favorably on the value of roentgen treatment of acute inflammatory conditions in children, particularly acute lymphadenitis and early mastoiditis. He emphasizes that the value of the rays is greater when used early in the course of the disease and states that the treatment should be given by a competent therapeutic radiologist. He has seen no harmful effects resulting from its use in these conditions.

Comment. From a perusal of the foregoing articles the physician is impressed with the variety and multiplicity of infectious states which are amenable to roentgen ray therapy. Indeed it may be said that in the presence of infection anywhere



A

Fig 1 A Conventional roentgenogram of chest Area of consolidation Arrow indicates faintly marked dark area B Laminagram of preceding, cavity clearly shown



B

C

Partial cautery pneumonectomy Death from sepsis C Photograph of lungs with extent of cavity clearly seen

by this means as to the existence, size, location and depth of the lesion was invaluable to the surgeon. Cavitation in areas of consolidation has been discovered by this means when its presence in the standard examination was not suspected (Fig 1).

In mediastinal lesions, the method has been useful also. In the case of the skull, the laminagraph can reveal conditions in the base of the skull which are ordinarily obscured by overlying shadows on ordinary roentgenographic exposures. It has been of invaluable service in the examination of the cervical spine, especially in the anteroposterior projection in cases of suspected trauma and tumor of the vertebrae. Also in portions of the rest of the spine the laminagraph portrayed lesions better than could be done otherwise. Of the joints of the extremities, only the shoulder has been investigated, and in both cases small avulsion fractures from the rim of the glenoid fossa of the scapula with loose fragments of bone were demonstrated when they could not be visualized by standard methods.

So far there is no evidence that the planigraphic examination of the abdominal content will supersede present methods of examination, and it remains to be demonstrated that it is of aid in the absence of a natural or artificial contrast in density. The employment of this method in conjunction with artificial contrast media, for example, the opaque meal, may at some time in the future prove to be of value, but for the moment one must regard such a possibility with a great deal of skepticism.

As regards the technique, the general principles which hold in standard roentgenography apply to planigraphy. Some details which the limited experi-

ence warrants are included and a routine examination is described. Choice of motion and consequent modification of the time of exposure are dependent on the depth of the layer to be roentgenographed and the nature of the overlying and underlying media. Normal roentgen-ray exposure should precede a planigraphic examination as it may aid greatly in predetermining the depth of the layer to be roentgenographed. There is every reason to believe that preliminary roentgenography is essential and that therefore planigraphy will not supersede, and cannot be substituted for the standard preliminary examination.

ADOLPH HARTUNG, M D

Crowther, J. A.: The Biological Action of X-Rays; A Theoretical Review. *Brit J Radiol*, 1938, 11 132

There has appeared in the literature since the discovery of the x-rays by Roentgen in 1895 an immense amount of material dealing with their biological effect. It is not the author's purpose to summarize all of this material but rather to discuss what light may be gleaned from this mass of experimentation on the problem as to how x-rays produce their biological effect. The action of x-rays on single cells and unicellular organisms is considered.

A striking feature of a survey of this type is the marked difference exhibited by different tissues to the action of radiation. A dose of 5 roentgens will kill half the individuals in a clutch of calliphora eggs, while a dose of 330,000 roentgens is required to destroy 50 per cent in a culture of colpidium. Only 120 roentgens are required to inhibit mitosis but 13,000 roentgens are necessary to produce even a

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Kleffer J. The Laminagraph and Its Variations
Am J Roentgenol 1938 33 497

The laminagraph is a device embodying the principle of roentgenographic body sectioning. Its fundamental principle is that the tube and film move during exposure in such a way that the roentgenographic shadow of a selected plane in a body remains stationary on the moving film while the shadows of all other planes have a relative displacement on the film and are therefore blurred in varying amounts depending mainly on the distance of such planes from the one selected. A brief historical review of the development of apparatus of this type is given by the author. Diagrammatic illustrations portray both how its objective is attained and some of the advantages it offers when desired parts are obscured by superimposed dense structures as revealed by ordinary roentgenography.

Various factors such as the character of the movement used, the amplitude of the motion and the distance of the target and film from the plane visualized affect the nature and amount of blurring and consequently the practical value of the method. All of these are discussed at some length. How the various problems are met by the laminagraph devised by the author is described in detail. The advantages and

disadvantages of various techniques for different clinical applications are also given due consideration. Devices for stereoscopic laminagraphs and elimination of secondary radiation incorporated in the equipment add greatly to its usefulness.

Theoretical analysis has disclosed future possibilities which have not yet been practically tested. It is possible to obtain roentgenographic visualization of planes at right angle to the long axis of the body, so-called 'transverse' or frontal sections, for instance sectional roentgenograms of the spine through or parallel to the vertebral discs with the body in normal position. Sections parallel to the floor of the skull and cross sections of long bones. Roentgenographic cross sections of the body at any level and at any angle desired, no matter how extensive may be the longest dimension of the body are another possibility. Roentgenographic application and radiopaque plani roentgenoscopy are entirely feasible. How these possibilities may be realized is discussed and illustrated diagrammatically.

Further consideration of theoretical data discloses that a machine embodying the special spiral motion described has potential applications in therapy. With the parabolic spiral used to actuate a somewhat modified linkage system it becomes possible to focus a large amount of radiation in a relatively small field in the body while it is spread fairly evenly through a very large portal of entry and thereby markedly diminish the effect on normal tissues as compared with the effect on the abnormal tissues which it is desired to treat.

WOLFE HARTMAN MD

Moore S. Body Section Roentgenography with Laminagraph. *Am J Roentgenol* 1938 39 514

Body section roentgenography serves to overcome the difficulty of separating superimposed densities as revealed by the ordinary roentgenogram. It does this by focusing on a particular object and removing or diminishing overlying or underlying images. The manner in which this has been accomplished by different investigators is briefly reviewed by the author. The author mentions objections to some of the terms which have been applied synonymously to the apparatus used and suggests the name of laminagraph as being preferable.

The equipment he has been using was devised by Kleffer and follows the general mathematical principles which govern all the methods now developed. Although it can be used with a variety of movements the spiral prevented advantages which led to its being used almost exclusively for clinical applications. These have been of rather limited extent and included only examinations in the pulmonary area, the spine and head in a few cases of the shoulder and of the sacro iliac joints.

All of the pulmonary cases were examples of surgical lesions and in several of them the aid supplied

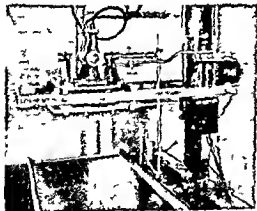


Fig. 1. A close up of the mechanism of a laminagraph. The tube supporting structure, actuating turntable and motor are shown. The plane to be visualized is selected by adjusting the pivot (arrow) of the rigid rod without changing the target film distance or moving the patient. The adjustable diaphragm under the tube support limits the roentgen ray beam and keeps it centered in one direction while a similar diaphragm (not shown) on the rocking tube cradle limits the beam and keeps it centered in the other giving a combined effect similar to that of a cone kept oriented toward the center of the object plane at all times.



A.

Fig 1 A Conventional roentgenogram of chest Area of consolidation Arrow indicates faintly marked dark area B Laminagram of preceding, cavity clearly shown



B

C

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A striking feature of a survey of this type is the marked difference exhibited by different tissues to the action of radiation. A dose of 5 roentgens will kill half the individuals in a clutch of calliphora eggs, while a dose of 330,000 roentgens is required to destroy 50 per cent in a culture of colpidium. Only 120 roentgens are required to inhibit mitosis but 13,000 roentgens are necessary to produce even a

delayed lethal effect. Cells are more sensitive during mitosis, and rapidly dividing and undifferentiated cells are more susceptible than adult tissue. Massive doses of 100 000 roentgens and upward will kill any living material. This action is probably due to chemical changes in the cytoplasm due to the liberation of a large amount of energy in the tissues. The surprising feature is that profound biological effects can be produced in the same tissue with something like one thousandth of the lethal dose of 100 000 roentgens.

The effects produced by small doses of radiation fall into 3 categories: (1) inhibition of mitosis, (2) production of mutations, and (3) death. Since mitosis and mutation are functions of the nucleus and since death of the cell is probably due to its inability to divide, it seems probable that the effect produced is due to some action of the radiation on the nucleus. The author believes that the seat of action is not in the nucleus as a whole but in specific structures in the nucleus. The resting nucleus is comparatively insensitive to radiation, but with the onset of mitosis and the resultant structural changes which occur, the nucleus becomes sensitive to small doses of radiation. The evidence in favor of the specific action being on a gene is strong.

A beam of x rays consists of a group or swarm of photons, the energy in each photon being proportional to the voltage. As these photons pass through matter a certain number are absorbed by the atoms and for each photon absorbed a photo-electron is ejected. The electrons ionize a minute fraction of the molecules through which they pass so that a trail of ions marks the path which they take. This process can be easily photographed. An alternative method of energy transference is the Compton scattering effect. The photo-electron absorption is effective for the longer x rays, but the Compton effect predominates for radiation above some 120 000 volts. In either type of absorption the point to bear in mind is that the energy available ultimately becomes concentrated in a small number of atoms. The energy liberated during the passage of 100 000 roentgens through a gram of tissue amounts to about one fifth of a calorie, while the energy which can be concentrated in one molecule is enormous and amounts to some 20 000 calories per gram. The discontinuous distribution of energy in x ray absorption must be kept in mind. If it were possible to pass x radiation at an intensity of 1 roentgen per second through the air of an ionization chamber continuously for five hundred years we should still leave about one third of the molecules unirradiated.

The author places the various theories of the biological action of x rays into two main categories which he has labeled the poison hypothesis and the target hypothesis. The poison theory postulates that certain unspecified poisonous material is produced in the nucleus by radiation. The target hypothesis assumes that action takes place whenever one of the biological structures is hit by the radiation. There is considerable disagreement as

to what constitutes a hit. Holweck and Lacassagne believe that it is the absorption of a photon in the structure, while the author suggests that a hit is registered when a pair of ions is produced within the sensitive particle. The ion pair theory postulates that the sensitivity should be independent of the wave length. This independence of sensitivity has been borne out in experiments on various types of eggs.

In his discussion the author raises many questions which are difficult to explain on the basis of the poison hypothesis. Since poisons are usually applied outside of the cell it becomes difficult to compare their action with a poison which is produced inside of the cell. An increase of temperature greatly enhances the action of chemical disinfectants, but produces no alteration in the action of x rays on various types of eggs. The bactericidal effect of a chemical disinfectant increases rapidly with the concentration, while all the evidence shows that the x ray effect depends only on the total dose and not on the rate of administration. The author finds it very difficult to explain various survival curves on the basis of the poison theory.

These survival curves, on the other hand, can be simply and rationally explained by the target hypothesis. Particles of microscopic size have a very fair chance of escaping the effects of radiation because of the wide distances which separate the points at which the energy is concentrated. Although the experimental survival curves can be simply explained by the target theory, it is necessary to examine the assumption on which the theory rests. It is necessary to assume that there are in the cell certain structures sensitive to radiation. Numerous experimental observations strongly suggest that the x rays act directly on the genes and not indirectly through the medium of the cytoplasm.

The experiments of Wyckoff in the killing of bacteria by ultraviolet light have been raised as an argument against the target theory. The author states that there is a very vital distinction between x rays and ultraviolet light. The energy of x radiation is measured in thousands of volts, while that of ultraviolet light used by Wyckoff is only 47 volts. Since the energy needed to produce a pair of ions lies between 6 and 10 volts, it would appear that a single quantum of this radiation could not, by itself, produce any ionization. Where it was possible to study cumulative ionization experimentally, the absorption of many photons was necessary for the production of a single pair of ions. The number of hits will be far fewer than the number of photons absorbed. The efficiency is probably not greater than 0.1 per cent.

If it can be shown that the action of x rays is a direct action on certain minute biological units, and as the only direct effect is the production of ionization, the biological effect must be the result of ionization. Anything further than this must be speculation as it is improbable that the nature of life can be discovered by physicochemical experi-

ments. The results of x-ray analysis cause considerable doubt as to whether the inception of a molecule has much real meaning in the solid state. Marked changes in biological properties have been brought about in complicated molecules by a very slight change in the constituent groups. The energy corresponding to a pair of ions is adequate to provide the energy necessary for any chemical reaction.

The inclination of the author is to seek a solution in terms of electrical charges. The change in structure which appears when a cell goes into mitosis is not dissimilar to the coagulation of colloid particles. Since the balance between the differentiated and homogeneous phases of the nucleus must be a delicate one, it is conceivable that an artificially induced change in the charge might easily delay the onset of the process, and give rise to mitotic delay, or disorganize the normal processes, and give rise to gene mutation. The author and fellow workers have shown also that it is possible to change the electrokinetic potential of a colloid as much as 10 per cent with a dose of only 20 roentgens. Changes of this magnitude in the colloidal constituents of the nucleus could hardly fail to produce marked biological effects.

EARL E. BARTH, M.D.

Renander, A: *The Radiological Treatment of Actinomycosis* (Le traitement radiologique de l'actinomycose) *Acta radiol*, 1937, Supp. 35

This is a complete historical account of our knowledge of actinomycosis, its localization, and various methods of treatment, especially with potassium iodide. Reference is made to the first treatment with x-rays carried out by Bevan, who in 1905 described 6 cases of actinomycosis which he had

managed with success by means of roentgen rays. Following his first work Bevan and a number of others reported favorable results, the most important and the most recent report being that of Forssell and his colleagues in Stockholm, who between 1915 and 1932 treated 52 verified cases of actinomycosis. Of these, 31 were cervicofacial, 13 abdominal, and the remainder genital, thoracic, cutaneous, or with an undetermined origin.

The technique of Forssell and his colleagues was as follows. Treatments were given in series with intervals of from six to eight weeks. In each series the patient received every day, or every other day, up to 1 skin erythema dose on each skin field. At each treatment the superficial dose varied somewhat, most often averaging between one-sixth and one-third of a skin dose. Fractionated treatment was found to provoke less pronounced symptoms of local reaction than strong doses. Radium treatment was also employed in some cases but in the form of a radium bomb or radium cannon, in which 3 gm of radium were used at a distance from the skin simulating the effect of penetrating x-rays. Generally the distance was 5 cm. Radium was always used in connection with the x-rays. Cure was obtained in 83 per cent of the cervicofacial lesions, and in 38.5 per cent of the abdominal cases. None of the patients with genital or thoracic lesions survived, and only 1 of the 2 with cutaneous lesions survived. As to the effect of the potassium iodide alone or in combination with radiological treatment, the author could not draw any certain conclusions. He was not able to determine any difference in the rapidity of cure in cases in which potassium iodide was not prescribed.

JAMES T. CASE, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

McKirdie M Pilonidal Sinus *Ann Surg* 1935
107 389

During a period of eleven years the author has observed 96 patients with a condition which has been diagnosed as pilonidal sinus. Several of these patients have been treated twice or oftener for recurrence of the original condition which makes a total of 113 instances. Although many newborn infants and children show a dimpling or depression over the sacrococcygeal region nevertheless the presence of a true sinus tract in adults is limited to about 3 or 4 per cent of the population. Males show a considerable predominance among the cases of this condition and most of the patients are in the third decade.

The theories of origin are concerned mainly as to whether the cyst or sinus arises from the neuroenteric canal or is the result of ectodermal invagination. The authors believe that clinical and experimental evidence lends more support to the former theory. The pathology and symptomatology in the average case are similar to those of a chronic inflammatory process which has undergone an acute phase with periods of chronicity and subsequent exacerbations.

Treatment consists essentially in the complete eradication of the sinus tract without the sacrifice of any more normal tissue than is necessary. McKirdie believes that the injection of the sinus with methylene blue is conducive to a false sense of security and the needless sacrifice of normal tissue.

Recurrences are frequent and are due to several factors namely failure to remove the sinus tract operation for excision in the face of acute infection, poor hemostasis and dead space with subsequent hemorrhage and infection. Jacob M Mora MD

Rogers H and Dwight R W Pilonidal Sinus
Ann Surg 1938 107 400

The authors report a series of 140 cases of pilonidal sinus which were all treated by cautery excision and open packing. The ratio of males to females was 3 to 1. In over 400 cases Rogers and Dwight have not seen a sinus communicating with the neural canal and they believe that roentgenographic examination after the injection of iodized oil is superfluous except in markedly atypical cases. Neither have the authors noted any extension of the sinuses into the sacral hiatus, sacrococcygeal joint or beneath the sacral aponeurosis.

Two essentials are necessary for cure: adequate removal of the diseased tissue and solid healing of the wound. Because of unavoidable obstacles to sound healing by first intention the authors believe that open packing and healing by second intention will produce the highest percentage of cures in unselected cases. In selected cases it may still be de-

sirable to incur the greater risk of failure associated with primary closure for the sake of shortening the treatment in those cases which terminate successfully. Jacob M Mora MD

Cutting R A, Lands A M and Larson P S
Distribution and Excretion of Water and Chloride After Massive Saline Infusions: An Experimental Study *Arch Surg* 1938 36 586

The experiments reported in this communication were designed to determine the maximum rate of infusion of an essentially isotonic solution of sodium chloride compatible with survival and the lethal dose. It was also proposed to find out the cause of death after such lethal infusions and to trace the intermediate assimilation, translocation and excretion of both the sodium chloride and the water when given in just sublethal amounts.

Using cats as the experimental animals in this work the authors came to the following conclusions:

The lethal value for infusions of a 1 per cent solution of sodium chloride in cats is 500 cc per kgm of body weight when the rate of injection is 5 cc per kgm of body weight per minute. In a man weighing 154 pounds or 70 kgm this would correspond to 35 liters at a rate of 350 cc per minute. Hypertonic solutions are lethal in smaller bulk and at slower rates of infusion.

During such massive infusions the blood pressure is neither greatly nor constantly affected. Vasodilatation and, particularly, diffusion of the solution into the tissue spaces serve to stabilize the blood pressure at an essentially normal level. At the time of death the blood pressure abruptly declines.

The important changes observed at autopsy are: (a) evidences of watery vomiting and purging; (b) swelling of the entire animal, especially of the abdomen; (c) the presence of a considerable amount of free fluid in the abdominal cavity; (d) edematous thickening of the stomach, the colon and the urinary bladder; (e) gelatinous edema of the pancreas, the space between the leaves of the mesentery and the retroperitoneal space; and (f) edema of the lungs and the salivary glands.

Unless pushed to a rather sharp end point of decompensation at which the blood pressure rapidly declines, infusions are not incompatible with rapid and complete recovery. The sharp end point is believed to represent some physiochemical imbalance rather than failure of any particular organ or system. Accidental death will occur in perhaps half of the cases before any considerable amount of solution has been infused if precautions are not taken to prevent regurgitation, aspiration of the regurgitated material and ultimate drowning of the animal in its own vomitus. Pyrogenic substances contaminating the water used in compounding infusions may account for some premature deaths.

The relative weights of the various organs and tissues of the body and the water content of these tissues and organs are comparable to those in man specifically when the cat is used in the laboratory. Experiments on the translocation of water following the administration of large intravenous infusions in the lower animals should therefore presumably be comparable with what occurs in man under similar conditions.

During and after a massive infusion both the water and the salt tend to leave the blood stream rapidly, they accumulate presumably in the tissue spaces. Relatively little water can be accommodated in such closely knit organs as the muscles and the skin, although because of their bulk their actual capacity for storage is considerable. Presumably the salt contained in the water thus stored is in essentially isotonic concentration. Organs, such as the alimentary tract (except the duodenum), the salivary glands, and the lungs, which act to some extent as natural water emunctories, seem to store water differently. They probably do not store it passively in their tissue spaces as in the case of the organs previously mentioned, but actively within their parenchymatous cells, where they are preparing it for excretion. Accordingly, analyses show that the duodenum, muscle, the spleen, and skin store sodium chloride and water in the proper proportions to make a 1 per cent solution. The liver, lungs, kidneys, pancreas, stomach, colon, and salivary glands, all organs concerned with the elimination of water, store water considerably in excess of the amount necessary to make a 1 per cent solution with their contained sodium chloride.

The cerebrum is the one tissue in the body which stores no water, though it seems to store some salt. Cerebral edema definitely does not occur after massive infusions of 1 per cent solution of sodium chloride and therefore cannot be the cause of death when the limits of toleration are exceeded.

Even during the course of the actual infusion of a massive quantity of 1 per cent solution of sodium chloride the kidneys eliminate a considerable amount of both the water and the salt. Before the infusion of this solution is complete nearly 20 per cent of both the water and the salt has been eliminated by the kidneys.

The amount of salt and water stored in the tissues, amounting to approximately 80 per cent of the total body weight, for which analyses were available, and the amount eliminated by the kidneys during the infusion equal about half of the total amount infused. The remaining half must have been stored in tissues constituting not more than 20 per cent of the total body weight. The most logical conclusion, in view of the spectacular gelatinous edema which was seen in the loose areolar connective tissues about the pancreas and in the retroperitoneal space, is that enormous quantities of water and salt are probably stored in these and other loose, areolar connective tissues throughout the body. These tissues, for obvious reasons, were not collected for analysis.

Within twenty-four hours after the administration of a just sublethal massive infusion of 1 per cent solution of sodium chloride all of the salt and about 80 per cent of the water have been eliminated by the kidneys. The rate of elimination is variable from hour to hour.

JOHN H. GARLOCK, M.D.

Uggeri, C.: The Xanthoprotein Reaction in Surgical Conditions (La reazione xantoproteica nelle affezioni chirurgiche) *Clin. chir.*, 1938, 14, 193.

After the first publication by Becher on the technique and importance of the xanthoprotein reaction, especially of the blood serum, numerous publications have appeared on this subject. There is a review of the technical literature on this subject.

There have been conflicting reports on its significance. The author describes the technique he used. He uses Oefelein's value of 30, as the normal figure, this was based on 10,000 determinations.

The author performed 191 determinations in 124 patients. His series included a variety of conditions, such as diseases of the biliary tract and prostate, neoplasm, renal tuberculosis, and intestinal occlusion.

The author is quite conservative about the significance of this reaction and deprecates too much trust in the test as a criterion of operability. In general surgical conditions mild elevations of the xanthoprotein reaction occurred which were of dubious significance. The most definite elevations occurred in renal conditions, diseases of the liver and biliary tract, and in intestinal occlusion. In renal conditions the elevation in the xanthoprotein reaction occurred in irreversible types of uremia. In these cases the xanthoprotein reaction was of grave significance as to life.

In general, it is not advisable to rely on the xanthoprotein reaction when it comes to deciding such serious questions as indications and contraindications for surgery, as well as prognoses.

JACOB E. KLEIN, M.D.

Sorce, G.: The Action of Ethereal Splenic Extracts upon the Healing of Wounds (Azione degli estratti eterici splenici sul processo di guarigione delle ferite) *Arch. ital. di chir.*, 1938, 48, 228.

Sorce reviews briefly the various methods which have been employed to induce rapid healing of aseptic wounds by second intention. These methods are generally based upon the local application of chemical, physical, electrical, or biological agents.

The most commonly employed chemical substances are a 5 per cent solution of sodium chloride and sodium citrate, magnesium sulfate and glycine, hypertonic solutions of sodium sulfate, and calcium chloride.

Several investigators have also studied the action of oxygen and of the halogen salts of calcium and magnesium. The stimulating action of the aniline derivatives and of coal tar has also been subjected to extensive study and research.

Biological methods include such procedures as transplants, periarterial sympathectomy, and the

application of various sera hormones or vitamins. Recently the favorable effect of cod liver oil has also been studied by several authors.

In the present study Sorce wishes to report the favorable effects upon wound healing obtained from the parenteral administration and local application of ethereal splenic extracts. Earlier studies revealed that these extracts when given intravenously to rabbits stimulate the parenchymatous portions of the reticulohistiocytic system.

Rabbits were used as experimental animals and the wounds were produced artificially by excising portions of the skin to the level of the muscular layers under strictly aseptic conditions. The speed of wound healing was studied in two groups of animals. In one group the splenic extracts were administered intravenously whereas in the other group the extract was applied locally.

The results obtained from this experiment showed that the administration of ethereal splenic extracts emulsified in physiological solution accelerates wound healing in rabbits especially if the extracts are administered intravenously.

Post mortem examination of animals treated over long periods of time with these extracts reveals changes especially in the spleen and bone marrow. The spleen shows a thickening of its capsule and of the splenic reticulum. The number of histiocytes in the follicles is increased and the latter are markedly hypoplastic. In animals treated over long periods of time the lymphoid tissue is found to have become progressively aplastic. The adventitia of the blood vessel is thickened throughout.

In the bone marrow the myeloid elements are aplastic and there is an increase of cellular elements of the megakaryocytic series. The medullary portions show atrophy and fibrosis.

On the basis of these findings the author concludes that the rapid healing of wounds is to be attributed to the stimulating action of the splenic lipoids upon the reticulohistiocytic system.

RICHARD E. SOAKA, M.D.

Gramer, W. On the Origin of Cancer. *Brit. M. J.* 1938 1 829.

The frequency of cancer increases rapidly as age advances and its death rate increases in almost geometrical progression with the decades.

All carcinogenic stimuli and agents such as chemical substances, physical agents and even gross parasites have in common the characteristic that they induce cancer only after a lapse of time occupying a considerable fraction of the normal span of life. The period of induction is characteristic for

each species, and is much more prolonged with a weak carcinogenic agent than with a very active one. During the prolonged action of these carcinogenic agents the tissue on which they act undergoes pathological changes and then cancer arises within this altered or precancerous tissue. That the preceding existence of such precancerous conditions is not generally recognized is due to the fact that these conditions need not be sufficiently severe to manifest themselves as a definite disease.

There are thus two phases in the development of cancer: (1) a preliminary phase, or the origin of cancer, and (2) the second phase, or "the growth of cancer." The preliminary phase extends over a long period of years, a considerable fraction of the span of life; therefore we have the characteristic age incidence of cancer. This phase culminates in the sudden transformation of a few normal cells into malignant ones. The development of this precancerous condition depends upon the action from without of agencies of the most diverse nature on the cells of a given tissue. When a cell within a precancerous area undergoes transformation into a malignant cell, a change occurs within the cell which confers upon it the biological behavior characteristic of malignant cells, i.e., autonomous growth. In the second phase there is thus produced a new race of cells which multiply slowly or rapidly but always without regard to the physiological needs of the tissue in which they have arisen and without regard to the physiological boundaries imposed after the growth of normal cells. By their destructive autonomous growth they kill the organism in which they have arisen. Whatever it is that drives the cancer cell on in its autonomous growth must reside within the cell itself and that intracellular change is irreversible.

The application of carcinogenic materials does not always produce malignant tumors. The effect of the agents is heavily conditioned by factors residing within the organism or the susceptibility and it is this susceptibility or tendency to respond with the development of cancer to carcinogenic influences, which is inherited.

The recognition of cancer in man as essentially a preventable disease is based on the correct interpretation of the well known characteristic age incidence of cancer, namely that the onset of cancer is always preceded by a long period of induction occupying a considerable fraction of the life span of the species, during which the tissue involved undergoes definite pathological changes. The origin of cancer can therefore be found by identification of the pathological changes which precede the onset of cancer and their causes.

SAUL H. KARY, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

NOVEMBER, 1938

SURGERY AND THE BASIC SCIENCES

THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

A C IVY, M D, Chicago, Illinois

CEREBRAL MOTOR CORTEX

A SERIES of important researches pertaining to the physiology of the cerebral cortex has been conserved so that it might be presented as a more complete, and therefore, more intelligible story for the purposes of these reviews. Even then the story is such that the subject matter does not make the reading simple. Yet, these advances are considered so important that they cannot be omitted from any attempt to review the recent advances in the basic sciences. These advances are mainly concerned with: (a) clarification of the syndromes of the motor and premotor areas of the cortex, (b) experimental production of convulsive states and their control, (c) the rôle of the cerebral cortex in the regulation of autonomic functions, (d) the functions of the prefrontal association areas, and (e) localization of the functions within the sensory areas of the cortex.

It is a well known clinical principle that flaccid paralysis indicates a lower motor neurone lesion and that spastic paralysis usually indicates an upper motor neurone lesion. During the past few years experimental evidence has been accumulating which indicates that either flaccid or spastic paralysis may be produced by properly located lesions in the motor cortex. In 1934 Fulton and Kennard (1) summarized their investigations on the symptoms produced by ablation of various portions of the motor cortex in various primates. They maintained that ablation of that portion of

the frontal lobe lying just anterior to the central sulcus (Brodmann's Area 4), which they call the motor area, results in a flaccid type of paralysis, ablation of the area just anterior to this (Brodmann's Area 6), which they call the premotor area, results in forced grasping, impaired motor power, and spasticity. They concluded that lesions of the pyramidal system produce flaccid paralysis, whereas lesions of the extra pyramidal system are responsible for spasticity.

In 1935 Walshe (2) subjected this view to a critical analysis and denied the adequacy of the evidence upon which the syndrome of the premotor area was based. He maintained that forced grasping is the only symptom which follows ablation of the premotor area. Much of his criticism was based on the fact that the physiological and histological evidence for the differentiation of motor and premotor areas was indefinite and unreliable.

In 1937 Hines (3) summarized the results of her investigations concerning the motor cortex of monkeys. She found that by the use of more adequate types of stimulating current, the histological Areas 4 and 6 could be accurately differentiated on the basis of the character of the responses obtained. All points from which isolated movements could be elicited were found to lie within Area 4. Only more complex movements resulted from stimulation of Area 6. The importance of the type, shape, and frequency of the current used for cortical stimulation has been emphasized by Wyss and Obrador (4) as well. These investiga-

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tors found that the ordinary inductorium does not deliver the proper kind of stimulus for excitation of the motor cortex. Using properly controlled condenser discharges they were able to elicit twitch responses in discrete muscles by applying a single stimulus to the cortex of Area 4. As the frequency of repeated stimuli was increased the muscular response changed from repeated twitches to a tonic contraction. A single stimulus applied to Area 6 yielded a twitch with a slow relaxation component and repeated stimuli entailed the gradual participation of larger and larger muscular groups. This work therefore brought the physiological and histological methods of differentiating separate cortical areas into agreement with one another. Hines (3) also discovered that electrical stimulation of the anterior border of Area 6 produced inhibition of movements. Ablation of this so-called 'strip' area was found to result in slight temporary paralysis with persistent spasticity of the proximal joints. This spasticity was characterized by increased supportive reactions, by clonus produced in response to sudden and maintained stretching, and by exaggerated tendon reflexes, in other words the spasticity was comparable to that seen clinically. Ablation of Area 6 alone produced forced grasping only. Ablation of Area 4 exclusive of the strip, resulted in paralysis with little if any evidence of spasticity. Hines interpreted these results to indicate that the pyramidal projections from Area 4 are mainly responsible for carrying out volitional movements whereas the extrapyramidal projections from the 'strip' in one case and from Area 6 in the other inhibit extensor tone and the grasp reflex respectively. In addition to these inhibitory functions the premotor area apparently integrates complex and highly organized movements by means of direct intracortical connections with Area 4.

Until recently there had been little direct evidence for the existence of the extrapyramidal projections from the 'strip' area and Area 6 which were postulated above. Recently Levin and Bradford (5) have investigated the exact origin of the corticospinal (pyramidal) tract in monkeys as revealed by the retrograde degeneration produced by cervical hemisection of the cord. They found that the bulk of the fibers composing this tract originates in Area 4 although approximately 20 per cent arises in Areas 3, 2 and 5 of the somesthetic area of the parietal lobe. No pyramidal fibers were traced to Area 6 or to the 'strip' area. Projection from these areas must therefore be extrapyramidal. Just as Hines had found that stimulation of the 'strip' inhibited movements originating in Area 4, Dusserre de Barenne

and McCulloch (6) have recently reported that stimulation of the 'strip' by means of the local application of strychnine suppresses the electrical manifestation of activity in the remainder of Area 4. These investigations established that the path way mediating this inhibitory effect originates in the 'strip' passes to the caudate nucleus then by way of the optic thalamus passes to Area 4. This work provided direct evidence that projections from the 'strip' area are extrapyramidal.

Fulton (7) in his recent excellent text book on the physiology of the nervous system offers the following interpretation of the situation. Primary removal of Area 6 causes abnormal muscular resistance, the quality and distribution of which does not conform with that characteristic of the human spastic state. The belief that lesions of Area 6 are concerned with spasticity was originally based on experiments in which Area 6 was removed after Area 4 had previously been ablated. Under these circumstances a previously flaccid extremity became highly spastic and remained so. 'The explanation of this apparent discrepancy lies in the fact that the intensity and duration of spastic resistance are functions not of any one area but of the extent of interruption of the extrapyramidal cortical projections.' The implication is that if all pyramidal projection could be interrupted uncomplicated flaccid paralysis would ensue and that if all extrapyramidal projections could be interrupted, extreme spasticity would result. However because of the overlapping of the two systems it is difficult if not impossible to accomplish a complete interruption of one tract without injury to the other. Since natural lesions are much less discrete than experimental ones it is only to be expected as every clinician has found that upper motor neurone lesions in man are accompanied in the vast majority of cases by spasticity.

In regard to bilateral representation in the motor cortex, Bucy and Fulton (8) reported in 1933 that stimulation of the medial portion of the junction between Areas 4 and 6 in the monkey elicited ipsilateral responses. Weiss (9) has recently found that by employing an adequate type of stimulating current ipsilateral responses may uniformly be obtained. However whereas the contralateral movements are of the usual clonus type the ipsilateral movements are of the tonic type. Fulton and Kennard (1), Hines (3) and many others have noted that the degree of bilateral representation in the cerebral cortex increases as one passes from the central sulcus anteriorly over the frontal lobes.

Bilateral representation has been noted also in the regions controlling movements of the facial

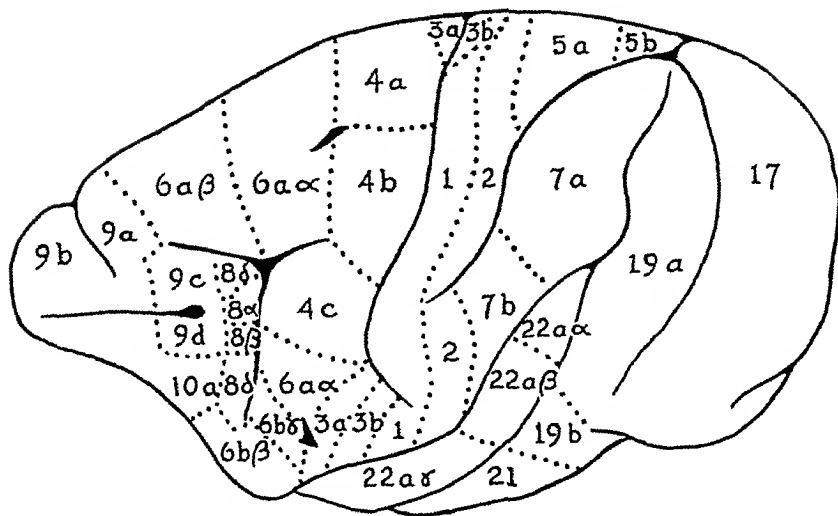


Fig 1 This is a diagram illustrating the definition of the various areas in the cortex of the monkey. Area 4 is the preolandic area or the area from which the pyramidal tract fibers arise. Area 6 is the premotor or extrapyramidal tract area.

musculature. Walker and Green (10) and Green and Walker (11) have made a detailed study of the corticomotor face area in monkeys, using both stimulation and ablation methods. They report that the lateral portion of the motor area No. 4 has direct projections to the labial muscles, orbicularis oculi, and intrinsic tongue muscles. The lateral portion of the premotor area No. 6 directly influences the activity of Area 4 without having extensive projections of its own. Other portions of Area 6 possess independent projections concerned with gross, and frequently rhythmical movements, particularly of the tongue and masticatory muscles, and with salivary secretion. They found that the lower facial musculature had predominantly contralateral representation, while the upper facial, lingual, pharyngeal, and laryngeal muscles were bilaterally represented to a considerable extent. An analysis of the factors responsible for the rather considerable recovery of motor control after ablation of the motor face area revealed the following to be involved: (a) the remaining ipsilateral cortex, (b) the contralateral motor cortex, (c) subcortical structures, and (d) other areas of the cortex, such as the parietal and prefrontal lobes.

It has been known for many years that some portion of the cerebral cortex plays a rôle in the modification of postural reflexes, since the latter become exaggerated and are more easily elicited and defined in the "thalamic" animal, i.e., one whose cerebral cortex has been removed. Bieber

and Fulton (12) have recently shown that the motor and premotor areas of the cortex are responsible for this inhibition of postural reflexes.

Convulsions have been produced in experimental animals by strong electrical stimulation of the cerebral cortex, but until recently this has been done only in anesthetized animals. Fender (13) has employed a "remote control" method of cortical stimulation for the production of epileptiform convulsions in dogs. At a sterile operation, a solenoid is introduced under the skin with electrodes applied to any desired portion of the cortex. After complete recovery from the operation the animal is placed within the field of a primary coil. The current induced in the implanted solenoid delivers an electrical stimulus to the cortex of the unanesthetized, unrestrained animal. Fender has applied the method to stimulation of the arm, leg, and face areas of the dog. Stimulation for from ten to fifteen seconds produces a tonic contraction in the muscles represented in the area of the cortex directly affected. Shortly after the stimulation is withdrawn clonic movements appear which spread to neighboring structures with a typical march until all of one side of the body is involved. If the original stimulus has been adequate, a generalized convulsion of both sides of the body appears. At this time the animal slumps to the floor scarcely conscious. The seizure may last for three or four minutes, followed by rapid recovery, during which the animal shows signs of motor paresis in the affected limbs. Ward

and Clark (14) have also produced convulsive seizures in unanesthetized cats by stimulating previously implanted and projecting electrodes. They made the same observations as Fender, but extended them to include stimulation of other portions of the cerebral cortex. Irritation of the sensory area of the parietal lobe produced convulsions only after a longer delay. The typical march phenomena did not appear, for when the convulsions began, all parts of one side of the body were affected simultaneously. Stimulation of either the occipital or frontal eye areas produced contralateral deviations of the eyes. Following the convulsions evidences of temporary cortical deficit were observed. Activity of the autonomic system was a constant phenomenon and included dilatation of the pupils, urination, vomiting, pilo motor reactions, and if clonic contractions of facial and masticatory muscles were present, salivation. The close resemblance between these seizures in lower animals and jacksonian epilepsy in patients is obvious. The variations in the type of onset and the train of symptoms which were found to depend upon the function of the cortical area which had been irritated lends further support to the interpretation of these variations which have been made in clinical investigations. It is possible that the application of this method to a study of other portions of the brain in primates may serve to elucidate some of the more complex changes which are sometimes noted in human epilepsy, such as automatism and psychic disturbances.

Generalized convulsions have also been produced in unanesthetized cats by the external application of electrodes to the head of the unoperated animal. Merritt and Putnam (15) have discovered a remarkable constancy in the threshold of current required to induce convulsions by this technique. This fact made the method useful in measuring the anti convulsant properties of various drugs. Phenobarbital proved to be the most

effective of the standard drugs used clinically in the treatment of convulsive states. Merritt and Putnam investigated a long series of drugs structurally related to phenobarbital in a search for a still more effective remedy. Several superior compounds especially diphenylhydantoin rewarded this search. This additional quantitative approach to the study of the control of epilepsy is a valuable contribution.

Recently cerebral control of autonomic functions has received increasing attention. Mention has already been made of certain autonomic phenomena associated with the cortex. Pinkston and Rioch (16) have recently confirmed the fact that ablation of the motor and premotor areas in monkeys produces an enduring contralateral vasoconstriction as revealed by changes in the skin temperature. Green and Hartzell (17) have traced the pathways mediating vasomotor effects in cats. In dogs, cats, and monkeys Smith (18) has localized two regions of the premotor area one of which stimulates, the other inhibits activity of the respiratory center. Stimulation in this region was accompanied by swallowing and changes in the blood pressure. Lindsley and Saksaman (19) have studied an interesting subject who possessed voluntary control of his pilomotor reactions. With out inducing an emotional state of fear and even while carrying on other activities this subject could cause immediate erection of hairs. He was also able to inhibit this reaction under circumstances when it would naturally occur. Examination revealed that the pilomotor effect was accompanied by a generalized sympathetic discharge including increases in the cardiac and respiratory rates, dilatation of the pupils, sweating, and a slight increase in the blood pressure. The subject was unaware of these accompanying reactions. The induction of this sympathetic discharge was found to be reflected in electrical manifestation over the premotor area of the cortex which attested to its cortical origin.

PREFRONTAL AREAS

The prefrontal association areas are of particular interest inasmuch as it is generally assumed that they are concerned with 'intelligence' and the control of behavior. Jacobsen (20) has studied the 'intellectual' deficit in monkeys and chimpanzees after bilateral ablation of the prefrontal areas. The animals were first trained in the performance of certain tests and problems. Bilateral removal of the prefrontal areas markedly impaired the ability of these animals to correctly carry out these tests and problems. The deficit is essentially

a disturbance in the organization of movements and behavior and a failure to respond in accordance with recent sensory experience. One of the chimpanzees used in this study became so emotionally upset when it made mistakes that it was rapidly developing a neurosis. After removal of the prefrontal areas it became impossible to evoke these emotional reactions although the animal made mistakes much more frequently than before the operation. As a result of this observation Moriz (21) in Portugal and later Freeman and

Watts (22) in this country have sectioned the prefrontal projections in the treatment of clinical nervous disorders with alleviation of the severe symptoms of the diseases

Two recent reports have appeared which relate other symptoms which follow ablation of these areas in monkeys. Richter and Hines (23) studied the activity and restlessness of such animals by means of recording devices which provided quantitative information. Bilateral removal of the prefrontal cortex produced a marked increase in activity. This effect they were able to localize to Area 9 of the prefrontal cortex, Areas 8, 10, 11, 12 being without effect. Unilateral ablation experiments were not successful unless the excised tissue included the tip of the caudate nucleus and putamen. They concluded that Area 9 of the prefrontal cortex controls activity through mediation of the corpus striatum. The animals were much more easily distracted than normally. Kennard and Ectors (24) excised various portions of the prefrontal area in monkeys in an attempt to localize the area which is responsible for the ipsilateral deviation of the head and eyes and the forced circling movements which follow hemidecortication. It was found that Area 8, which lies just anteriorly to Area 6, is responsible for these symptoms. It is well known that stimulation of Area 8, which regulates eye movements, produce conjugate horizontal deviation of the eyes away from the side stimulated, followed by turning of the head. Monkeys with unilateral ablation of Area 8 showed, in addition to rotation of the eyes and head, forced circling, i.e., they were unable to walk except in circles. The animals were rest-

less and apparently did not appreciate visual stimuli in the contralateral visual field. After bilateral ablation the animals tended to sit motionless with fixed gaze, and although they were not blind, as was shown by the fact that they followed moving objects, they were apt to run into obstructions, and they failed to realize that food presented to them was something to be eaten. Later they recovered a good deal, but retained a wooden expression and circled in either direction when walking. Stereotypy and the forced character of their movements were conspicuous, the animals apparently were hyperactive, although this condition was not measured quantitatively.

These areas of the frontal lobe have only extrapyramidal projections. In a study of the frontal lobe connections of the monkey, Levin (25) has reported that projections from Area 8 extend to the substantia nigra and to the tegmentum of the mesencephalon, and that projections from Areas 9 to 12, inclusive, send numerous fibers to the rostral part of the thalamus, particularly the lateral and ventral nuclei. In addition, certain fiber bundles extend to the substantia nigra and the pontine nuclei. Hirasawa and Kato (26) have described extensive tracts from Areas 8 and 9 to the head of the caudate and putamen.

Levin (27) has studied a number of children who exhibited marked restlessness and morbid hunger, accompanied by mental deficiency. A high incidence of cerebral lesions which were diffuse, but often most severe in the frontal lobes, was noted in these cases. These symptoms in children resemble those seen in animals after frontal lobectomy.

SOMATESTHETIC CORTEX

During the past few years several careful anatomical studies have been made of the fiber tracts which terminate in the somatesthetic area of the cerebral cortex. As a result of the work of Poliak (28), Walker (29), and Clark (30) it is known that thalamocortical projections terminate in Areas 4 and 6 of the frontal lobe, areas which are ordinarily considered to be exclusively motor areas. These fibers originate in the cerebellum and presumably subserve proprioceptive functions. Fibers which ascend in the spinothalamic tract are relayed by the thalamic nuclei to Areas 3, 1, and 2 of the postcentral convolution of the parietal lobe. It is noted that the posterior parietal lobule, which includes Areas 5 and 7, receives its main projections from the association nuclei of the thalamus, i.e., the pulvinar and lateral nuclei of the thalamus.

According to these anatomical studies the sensory cortex is more extensive than had generally been realized. There is both experimental and clinical evidence which substantiates the fact that the motor areas also have sensory functions. Dusser de Barenne (31) has studied the sensory phenomena, including hyperesthesia, paresthesia, and hyperalgesia, which can be produced in animals by the local application of strychnine to the thalamus and to the cerebral sensory cortex. His results revealed that the sensory area of the cortex extends into the frontal lobe motor areas. He found in addition that there are sharply defined sensory areas for arm, leg, and face in both the cortex and in the thalamus. Thus the physiological as well as the anatomical evidence reveals an important interrelationship between the thalamus and the sensory cortex. Skin sensibility, such as

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there any difference in the age of maturity. When the chickens were placed upon a rachitogenic diet, which was calculated to reveal any disturbances of the calcium metabolism, the time of appearance and the severity of the rickets was identical in thymectomized and control animals. No difference in blood-calcium levels could be detected. Egg production began at the same time in the two series, and the eggs laid by the thymectomized chickens could not be distinguished from those laid by the control animals.

It has generally been assumed that if the thymus gland is an endocrine organ, it must be concerned with growth. The early literature contains numerous papers concerned with this aspect of the question. However, in 1919 Park and McClure (40) concluded from their own careful work and a critical review of the literature that extirpation of the thymus produces no detectable alterations in the growth, development, strength, activity, or intelligence of experimental animals. More recently Rowntree, Clark, and Hanson (41) have reported that daily intraperitoneal injections of an extract prepared from the thymus, continued over several generations of rats, will markedly hasten the rate of growth and maturation of offspring. Following this lead, Einhorn and Rowntree (42) found that thymectomy continued over several generations of rats resulted in the retardation of growth. It has recently been reported that thymus implants (Einhorn and Rowntree, 42) or the administration of thymus extract (Einhorn, 43) will correct the deficiency produced by extirpation of the thymus over several generations. It is rather difficult to understand the significance of an endocrine gland, the influence of which is exerted solely on the offspring. Nor is the rôle of the thymus in regulating growth and development clarified by the reports of Asher (44) and his co-worker Nowinski (45) who state that highly purified thymus extract (thymocrescin) stimulates growth, overcomes the loss of weight incident to a diet deficient in vitamins, and causes enlargement of the gonads in the injected generation.

In 1932 Andersen (46), in her review on the thymus gland, was able to conclude only two facts: gonadectomy delays thymic involution, and gonadal implants hasten involution. Recently Lauson, Heller, and Sevringhaus (47) and Inay and Thompson (48) have shown that gonadectomy not only delays involution but produces an actual hypertrophy. Lauson *et al.* found that small doses of estrone prevent this hypertrophy and larger doses produce involution. Inay and Thompson reported that testosterone, as well as estrone, caused thymic atrophy. Progesterone was with-

out effect on the thymus. These results were also obtained by Schacher, Browne, and Selye (49) in adrenalectomized animals. The final link in the chain was provided when Inay and Thompson found that gonadotropic hormone hastened atrophy of the thymus in animals with intact gonads. Thus the rapid involution of the thymus which occurs after puberty is the result of the increased production of sex hormones which is presumably controlled by the hypophysis.

That other endocrines may be involved in this process is suggested by recent studies on the interrelationship of the thymus and adrenal glands. Inay and Thompson (48) reported that enlargement of the thymus followed adrenalectomy as well as gonadectomy. Selye (50) has studied the "alarm reaction" which consists of adrenal enlargement, involution of lymphatic tissue including the thymus, cellular degeneration in various tissues, ulcer formation in the gastro-intestinal tract, and edema. This reaction is a non-specific response to severe damage, which may be produced by a variety of agents, such as drugs, surgical trauma, and spinal shock. He found that although adrenalectomy aggravated most of these symptoms of the "alarm reaction," it prevented the usual atrophy of the thymus. Moon (51) has reported severe atrophy of the thymus after the administration of adrenocorticotrophic hormone to castrated rats. Ingle (52) reported the same reaction to injections of adrenocortical extracts. These results suggest that the adrenal cortex may be an important factor in the activity of the thymus gland.

Although this recent work reveals the influence of other organs on the thymus, it sheds very little light on the influence of the thymus on structures and functions of the body. Attempts to demonstrate a relationship between the thymus and genital development have been numerous but contradictory. Recently Gershon-Cohen, Shay, Fels, Meranze, and Meranze (53) have used x-ray irradiation of a localized area over the thymus to produce involution in newborn rats. The rat was selected because it is relatively immature at birth and maximal effects from thymic inactivity would be anticipated. The most marked effects were noted in the male rats which were irradiated. These animals showed a retardation in growth, enlargement of the adrenals and hypophysis, and underdevelopment of the gonads. Histological examination revealed a complete absence of spermatogenesis in the male gonads, a finding which was supported by the fact that these animals were found to be sterile. On the basis of these findings these authors point out the possible

pain and temperature showed extensive bilateral representation in both cortex and thalamus where as the deeper sensibilities showed contralateral representation almost exclusively. Since local strychninization of one arm area produced symptomatology in the cutaneous sensibility of both arms, even after removal of the opposite cortex, Dusser de Barenne believes that the local strychninization must 'fire' the whole arm area of both the cortex and the corresponding area of the thalamus. Firing of the latter may then be responsible for the bilateral symptomatology. According to this view the thalamus must subserve a high level of sensory integration. It is well known that pain may be recognized at the thalamic level, this may also be true for other gross sensations. This leaves for the cortex the rôle of differentiation within sensation: i. e., localization of sensory stimuli (topognosis), and discrimination between degrees of roughness, weight size and shape (stereognosis). Recently Dusser de Barenne and McCulloch (32) have extended this work to a study of the effect of local strychninization on the electrical activity of various areas of the brain in monkeys. In these experiments they have been able to show that local strychninization of a small area of the cortex markedly increases electrical activity in corresponding areas of the thalamus. These results therefore support their original interpretation. Penfield and Boldrey (33) have mapped in some detail the sensory areas of the human cortex. They obtained sensory responses to stimulation in the motor areas of the frontal lobes. By means of electrical stimulation in patients able to describe the sensation and its apparent location they were able to localize somatic areas in much greater detail than can be done with strychnine in animals.

Woolsey and Bard (34) have also provided evidence that the precentral areas are concerned with sensory functions in monkeys. Ablation of the parietal cortex abolished placing reactions which are dependent upon tactile sensations but hopping reactions which depend upon proprioceptive sensations were not affected and must therefore be mediated by frontal lobe areas. The results obtained by stimulation ablation and anatomical studies are therefore in accord in showing

that the precentral cortex subserves the sensory functions as well as the motor functions and that the former are mainly proprioceptive in nature.

If, as mentioned above, the rôle of the sensory cortex is mainly that of discrimination then impairment of this function should be detectable following excision of the parietal lobes. Ruch, Fulton and Cerman (35) tested the ability of the monkey, chimpanzee and man to discriminate differences in weight, roughness and shape of objects after destruction of the parietal lobes. The operation had very little effect in monkeys; in chimpanzees the deficit could be corrected by training; in man a residual deficit remained which could not be corrected by training. These results revealed an increase in the degree of corticalization of sensory discrimination in the higher forms. Excision of various portions of the parietal lobe gave no evidence for localization of discriminatory ability in any particular area.

Marshall, Woolsey and Bard (36) have recently conducted some interesting experiments on anesthetized monkeys in which tactile stimuli were applied to various portions of the body surface and the location of the consequent electrical potential waves on the cerebral cortex were mapped. By this method they found a very definite and discrete representation of tactile sensibility in Areas 1, 2 and 3 of the postcentral lobule of the parietal lobe. The parts of the contralateral surface were found to be represented in an orderly sequence on the surface of the cortex. In the case of the lower extremity this sequence clearly reflects the metameric origin of the dermatomes; the arrangement is in the order of spinal innervation not in the order—hip thigh knee leg ankle foot toes. No evidence for bilateral cortical representation of tactile sensation was found except for the face. There was some evidence however that strong stimuli capable of eliciting pain might give rise to cortical potentials in both somesthetic areas. It was also noted that when a stimulus was accompanied by a movement, potential waves were detectable in the precentral area. This is additional evidence in favor of the view that the sensory projections to the precentral areas are proprioceptive in nature.

THYMUS

Many years ago Soli (37) and Riddle (38) reported that the thymus gland is necessary for the formation of the egg shell and egg white in chickens. Reports have also occasionally appeared which professed to implicate the thymus

gland in bone formation and calcium metabolism. Recently Maughan (39) has made a careful investigation in chickens regarding these claims. He found no difference in growth curves between thymectomized chickens and controls nor was

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Da Costa, F. Surgery of the Temporomandibular Joint (Notas sobre a cirurgia da temporo-maxilar) *Bol clin estat*, 1937, 1 31

After having briefly discussed the anatomical and physiological aspects of the temporomandibular joint, Da Costa enumerates the various pathological conditions involving this highly specialized articulation.

Temporomandibular ankylosis is fortunately a rare condition, although it is one of the most important ones as can be seen from the statistics of Bassini and Orlow in 1910. Any ankylosis of this joint immobilizes the mandible. The immobilization may be due also to scarred mucous surfaces in the buccal cavity, and to muscular hypertonia either of toxic or infectious origin (trismus).

Bassini defines a true ankylosis as a condition characterized by pathological alterations of the parts which constitute a joint.

Although this condition may occur at almost any age, Orlow notes that in about 65 per cent of the cases it occurs in early infancy and adolescence. Da Costa believes that this high incidence in children and babies is due (1) to their predisposition to the exanthematous fevers which are frequently complicated by endo-articular changes, and (2) to the fact that the periosteum in that age group has a high osteogenetic capacity.

According to Orlow, trauma such as a fall on the chin, a blow in the face, or a fracture, is the most frequent cause. Other causes are trauma to the wisdom tooth, and arthritic conditions due to gonorrhea, scarlet fever, typhoid fever, measles, and diphtheria. The condition may also be congenital. Because of the fact that only a few cases have come under the author's personal observation, he is unable to determine the incidence of the various causes.

From a surgical point of view little information is found in the literature concerning the anesthesia to be employed, the postoperative treatment, and the roentgenological examination.

Concerning the anesthesia, it was customary prior to the advent of local anesthesia to use general anesthesia, which was fraught with considerable danger because of the possibility of asphyxia resulting from the aspiration of vomitus. The author, therefore, suggests the use of infiltration anesthesia with a 1-per-cent novocaine solution and adrenaline. For a good infiltration about 20 ccm are sufficient.

When an injection is made into the posterior portion of the condyle, care should be taken that the external auditory canal is not injured and that a large blood vessel is not entered inadvertently.

Concerning postoperative treatment, the author states that absence of movement sets up a vicious circle which leads to edema of the connective tissue and muscular atrophy due to hyponutrition. In order to avoid these often irreparable consequences, the author suggests active exercise, which is in his opinion more beneficial than passive exercise. Active exercise should not be limited to only a few periods during the day but should be continued also during the night. Suitable instruments, such as wedges made of wood, bark, or rubber, may be used for this purpose. The rubber wedges prove most satisfactory because traumatism to the teeth is avoided by the equal distribution of the forces. Care should be taken that the patient does not swallow the wedge. Other more elaborate devices, such as Darcissac's, may also be employed with good results.

Da Costa finally emphasizes the importance of adequate x-ray films in order that a good visualization of the lesion be obtained. With the aid of roentgenological visualization the surgeon may select the most suitable type of intervention.

The author presents a series of cases which were treated according to the foregoing principles, and offers several interesting and instructive illustrations.

RICHARD E. SOMMA, M.D.

EYE

Birge, H. L.: Cancer of the Eyelids: I Basal-Cell and Mixed Basal-Cell and Squamous-Cell Epithelioma. *Arch Ophthalm*, 1938, 19 700

Recently the records of 464 cases of cutaneous cancer which arose from the eyelids or the conjunctiva, or from both, were studied. Of the carcinomas in this series, 230 were examined and graded histologically. Of the 230 growths, 139 were basal-cell epitheliomas, and approximately 14 per cent, or 32 of them, were mixed basal-cell and squamous-cell epitheliomas. This paper is primarily concerned with these two groups.

The cause of all types of epithelial tumors is related to some extent to trauma and to chronic irritation. In this series, 29.5 per cent of the basal-cell epitheliomas were said to be definitely related to these factors. Of the mixed-cell epitheliomas, 31.2 per cent were associated with a history of chronic irritation of some type.

In 19 of this group of 130 cases of basal-cell epithelioma, the most radical type of treatment was used, that is, exenteration of the contents of the orbit. In 9 other cases it was necessary to enucleate the globe. In many of these cases varying doses of radium were given in addition. Treatment of the remainder of

detrimental effects which might follow irradiation of the thymus in infants

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2 When movable nodes are palpable, similar irradiation is given, followed in from two to six weeks by radical neck dissection if the primary lesion appears to be controlled. No further irradiation is given unless there is a recurrence.

3 If the nodes are fixed, irradiation is given to the neck, followed in from two to four weeks by a wide surgical exposure of the area and implantation of radium needles (from two to eight to mgm needles), which are permitted to remain for from eighteen to thirty hours. Under no circumstance does the author advise the removal of neoplastic tissue before the application of radium.

4 If the growth has perforated the skin with ulceration and secondary infection, caustic irradiation followed by high-voltage irradiation occasionally produces healing.

The author then presents 2 illustrative cases treated by these methods, with photomicrographs to show the resultant changes in the tissue following irradiation.

5 If the capsule of the node is involved as indicated by the physical findings, operation is futile because of the high degree of malignancy of the tumor and the unavoidable contamination of the operative field with subsequent local recurrence.

6 Neck dissection is contra-indicated in the presence of bilateral metastases, it is also contra-indicated when there is contralateral involvement, because this involvement extends to the ipsilateral nodes.

7 Distant metastases contra-indicate operation.

8 The general condition of the patient and the life expectancy must be considered before any radical surgery is undertaken.

The author concludes by stating that surgery offers a better chance of cure in the operable cases, whereas in the advanced cases well outlined irradiation treatment will give a longer life expectancy and greater comfort than an extreme and futile operative procedure.

BRADFORD CANNON, M D

PHARYNX

Martin, H E. *The Treatment of Pharyngeal Cancer*. *Arch Otolaryngol*, 1938, 27, 661.

Martin believes that the treatment of malignant tumors of the pharynx is mainly a problem of irradiation, although surgical intervention often must be employed as well to facilitate the placement of interstitial implants and for the management of the complications following aggressive radiation therapy. Since the introduction of protracted, or fractionated, roentgen irradiation, as developed by Coutard, the results of treatment of pharyngeal cancer have greatly improved. The favorable results obtained in a certain percentage of cases, in the author's opinion, have led to some overenthusiasm and to attempts to cure all forms and stages of pharyngeal cancer by protracted roentgen irradiation alone.

The exclusive employment of roentgen irradiation in all cases is, in all likelihood, not the best solution

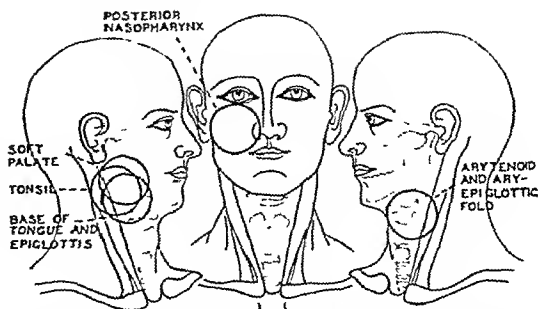


Fig. 1 The position of skin portals for the treatment of lesions in various anatomical locations. The use of small portals requires accurate localization according to the site of the underlying tumor.

of the problem of pharyngeal cancer. Complementary or supplementary interstitial irradiation with gold radon implants in combination with protracted roentgen irradiation will permit the control of conditions which would resist treatment by any single method.

A combination of the two methods is of particular value for the treatment of an especially resistant portion of the primary lesion, a cervical node, or such cervical metastases as may not be included advantageously within the skin portal except by the use of excessively large fields. The open mouth may be utilized as an additional portal for the treatment of many intra-oral lesions and lesions of the upper part of the pharynx. Undue effects on the skin and heavy irradiation through the salivary glands and the mandible are thereby avoided.

In the region of the palatine tonsil one may expect favorable results from radiation therapy. In the tonsillar region, the supplementary use of gold radon seeds immediately on completion of the protracted external irradiation is both safe and highly desirable for the treatment of residual tumor or of resistant portions of the growth, which are often found when the tumor has invaded the soft palate and the base of the tongue. A growth in the epiglottis should in most cases be dealt with by external irradiation alone. For the aryepiglottic fold, arytenoid, and piriform sinus, external irradiation must bear the entire burden of treatment of the primary lesion, except in cases in which an adjacent cervical node may be used to hold the radon seeds, not only for the control of the node itself but for irradiation of the adjacent primary lesion.

To procure the most favorable results in the treatment of pharyngeal cancer Martin depends chiefly on protracted roentgen irradiation, but the highest degree of success depends on the proper combination of methods and the supplementary use of interstitial irradiation with radon in a considerable percentage of cases. The technique used in the treatment of pharyngeal cancer at the Memorial Hospital for the Treatment of Cancer and Allied Diseases, New York, is discussed in detail. NOAH D. FARBIGANT, M D.

the cases consisted of excision including diathermy and cauterization, or a combination of operation and irradiation.

In this series exenteration was performed on 20.7 per cent of the patients with mixed cell epithelioma and on only 14.9 per cent of those with pure basal cell epithelioma. This difference in treatment may be in favor of the prognosis of the mixed type of tumor, the more radical method causing a lower gross mortality. If such is the case the malignancy of the mixed basal cell and squamous cell epithelioma is not as much lower as it appears.

Of the 139 patients with basal cell epithelioma contact was maintained with 127 until 1936. In some cases this represented a follow-up study of more than fifteen years duration. The mortality rate of the basal cell epitheliomas of the eyelid was 11 per cent, that of mixed basal-cell and squamous cell epitheliomas was 6.8 per cent.

Of the patients who had basal cell epithelioma of the eyelid 46.1 per cent lived fifteen years or more after they received treatment. Of the patients who had mixed basal cell and squamous-cell epithelioma 73 per cent lived fifteen years or longer after treatment was received.

The basal cell lesion was more malignant than was either the mixed basal cell and squamous cell epithelioma or the lower grades of pure squamous cell epithelioma.

Blindness resulted from basal-cell epithelioma in 25.9 per cent of the affected eyes in 127 patients in whom a follow-up study was made. Blindness was equally frequent in the group of patients with mixed cell epithelioma.

Epitheliomas near the eyelid and conjunctiva show definite variation in their ability to cause blindness and death according to their pathological types. It is important for the clinician to know whether an epithelioma is of the basal cell type, the squamous cell type, or a mixture of both.

The prognosis varies not only with the pathological type but with other factors including age of the patient, size of the lesion, the type of treatment received previously, and occupation of the patient. Especially important with regard to the treatment of the early lesion is its situation on the eyelid. The chief danger associated with any tumor of the eyelid lies not so much in the occurrence of metastasis as in extension of the process into the orbit and into the cranial cavity.

To the ophthalmologists the basal cell lesion of the eyelid becomes important in proportion to its ability to blind or to kill. The mortality and blindness resulting from basal cell epithelioma could be reduced considerably if patients would report earlier for treatment and if they were observed more regularly after treatment had been given until they were cured. Only 20 per cent of the patients in the entire series of 464 sought adequate treatment in the course of the first year.

In order to save time which is important in dealing with malignant growths of high grade epithe-

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Duffy, J. J. Cervical Lymph Nodes in Intra Oral Carcinoma: Surgery or Irradiation? *Am J Roentgenol* 1934 39 767.

In discussing the evolution of the treatment of intra oral carcinoma the author outlined indications and contra indications for neck dissection using 252 cases of carcinoma of the lateral border of the tongue which had undergone treatment from 1923 to 1931. In the light of these criteria he arrived at the following conclusions:

1. Radical surgery of the cervical region should be delayed until the primary lesion is apparently controlled but moderate external irradiation to the neck may be given as a growth restraint in the interval.

2. When the disease involves both sides of the oral cavity i.e. originates in the midline or extends across it radical surgery is contra indicated because it is unlikely that the primary lesion can be controlled and because bilateral neck dissection has rarely eradicated bilateral disease.

3. The grading of the tumor and its location may contra indicate operation because of the invasive character of the tumor and the danger of ulceration and hemorrhage following operation. Statistically the author finds that the location of the tumor and its malignancy can be closely correlated.

4. About 50 per cent of the series of 85 patients with operable nodes in the neck were irradiated and the rest were operated upon. 11.4 per cent of the irradiated group and 21.9 per cent of the operative group were alive after five years.

5. In the absence of palpable cervical metastasis operation is contra indicated because in this series 40.8 per cent of the patients showed no evidence of node involvement throughout the disease. Only about 20 per cent developed operable nodes and 20 per cent developed inoperable nodes, the latter group presenting highly malignant or bilateral types. If routine neck dissection had been done there would have been 123 unnecessary operations.

BRADFORD CANNON, M.D.

Jacob, H. W. Irradiation of the Cervical Glands in Carcinoma of the Mouth and Lip. *Am J Roentgenol* 1935 39 78.

The author discusses the different opinions regarding the method of treatment of the cervical lymph nodes in carcinoma of the lip, tongue and mouth with particular emphasis on cases without palpable lymph nodes. He then outlined his methods of treatment which are as follows:

1. In the absence of visible or palpable nodes high voltage irradiation is given to each side of the neck for a period of from ten to fourteen days until there is a definite visible erythema. This does not interfere with later neck dissection.

2 When movable nodes are palpable, similar irradiation is given, followed in from two to six weeks by radical neck dissection if the primary lesion appears to be controlled. No further irradiation is given unless there is a recurrence.

3 If the nodes are fixed, irradiation is given to the neck, followed in from two to four weeks by a wide surgical exposure of the area and implantation of radium needles (from two to eight to 10 mgm needles), which are permitted to remain for from eighteen to thirty hours. Under no circumstance does the author advise the removal of neoplastic tissue before the application of radium.

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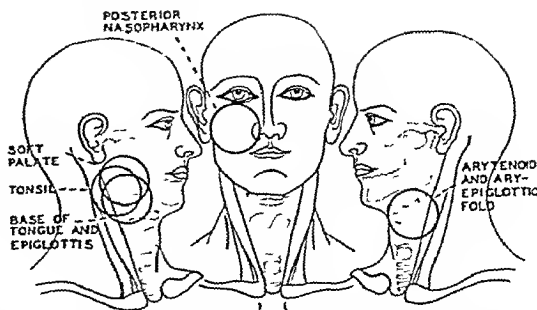


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Of the patients who had basal cell epithelioma of the eyelid 46 per cent lived fifteen years or more after they received treatment. Of the patients who had mixed basal cell and squamous cell epithelioma, 75 per cent lived fifteen years or longer after treatment was received.

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BRADFORD LYNN M.D.

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THE SURGICAL TREATMENT OF HYPERTENSION

Collective Review

JOHN MARTIN, M D, Chicago, Illinois

IMPRESSED by the widespread interest in the treatment of essential hypertension, Leriche (77) in 1935 made the statement "Le traitement chirurgical de l'hypertension artérielle est à l'ordre du jour." Fitting as it was for that year, it is even more applicable to the present time, for the current medical literature is filled with clinical and experimental reports on the subject of hypertension, and so complex has the subject become through the work done, both important and insignificant, on the etiology and surgical therapy of hypertension, that the rapidly expanding literature threatens to reach the state of confusion which existed a few years ago on the subject of endocrine physiology. The surgical treatment of hypertension is, indeed, the subject of the day.

A search through the literature of recent years on the subject of hypertension, especially relative to the surgical treatment of this syndrome, reveals a startling multiplicity of theories as to its cause and nature, and an equal or greater number of suggestions for its proper treatment. It is obvious that in a review of this nature all these hundreds of articles cannot be quoted or even referred to, but an attempt has here been made to bring together into a condensed form the present-day concepts concerning the nature of hypertension and its treatment by surgical means, as well as an interpretation of some of the more important experimental work which is being done. Time alone has proved the fallacy of many theories. Many reports were clearly without logical conception in their beginning. Much unjustified surgery has been done and is still being done, a condition which has existed, no doubt, in the early treatment of every perplexing disease entity in which surgery was employed. Worthless reports, carelessly conducted experiments, repeated theorizing without experimental basis, futile classifications, and other factors have produced such a complexity of ideas and confusion of purpose that until quite recently it seemed that the surgical treatment of hypertension offered little promise of help. It is encouraging, however, that the past year or two

finds some order arising out of the chaos, that collective thinking and agreement are occurring among surgeons, and that more and better experimentation is being done.

From some quarters come bitter criticisms against the use of surgery in the treatment of hypertension, and the usual argument is that treatment as radical as sympathectomy should not be employed for a *symptom*, of which the *cause* is still unknown. It is true, unfortunately, that the etiology of, or pathological basis for, hypertension is in the main unknown, but surgery has in many instances given undeniable relief where medical treatment has admittedly failed. By some men, mainly unsympathetic toward surgical treatment, hypertension has been postulated to be the result of high protein diet, emotional stress, obesity, the menopause, worry and overwork, tobacco, alcohol, "auto-intoxication," intestinal absorption of streptococcic toxins (Rose, 1933), goiter (King, 1933), gonadotropic-hormone imbalance, syphilis, hereditary influences, and dozens of other environmental and physiological factors. The individual physician has treated his patients according to his theory of the cause. Carbon-dioxide baths, mud baths, hydrotherapy, intestinal douches, various forms of rest, various forms of exercise, drugs of various and conflicting types, watermelon-seed extract (Althausen and Kerr, 1929), psycho-analysis (Menninger), diathermy (Gunewardene, 1933), active and passive movements of the spinal column (Cyrilav, 1917), veratrum viride (Douthwaite, 1931), and even prayer have all been used by different clinicians, and, as might be expected, the reports of their success are often glowing with enthusiasm. Such an admixture of theory and irrational treatment necessitates no comment, and it leaves little ground for criticism of the efforts of surgeons to ameliorate the ill effects of hypertension, if they are treating only a symptom, so long as their surgical attempts are guided by careful clinical and experimental study of their problem.

EXPERIMENTAL INVESTIGATIONS

One of the greatest obstacles in the understanding of the nature of hypertension is the fact that the physiology of the autonomic nervous system

From the Division of Surgery, Northwestern University Medical School, Chicago.

NECK

Sciaky I. *Experimental Hyperthyroidism in Different Species of Animals (Hyperthyroïdisme expérimental chez différentes espèces animales)*
Ann d anat path 1938 25 163

In order to produce experimental hyperthyroidism the author used thyroxin by hypodermic injection. Eighteen animals were used in 3 groups as follows: (1) 2 guinea pigs who received large doses of thyroxin and who survived only eight and ten days respectively; (2) 2 guinea pigs, 3 rabbits, 2 cats and 2 rats, all of which received small repeated doses for periods varying from seventy seven to one hundred and ninety six days; and (3) 2 guinea pigs, 1 rabbit, 1 cat and 3 rats, all of which received small doses of thyroxin plus small doses of copper for one hundred and thirty four to two hundred and ninety four days. The copper was given with the idea that it would induce certain toxic visceral changes and thereby intensify the action of the thyroxin. Most of the animals died spontaneously. The organs were fixed in Mueller formalin and alcohol, embedded in paraffin and celluloidin and stained with hematoxylin-eosin, Scharlach rot, van Gieson or Unna-Pappenheim stain or according to the method of Tibor Pap. A few were stained with Ziehl's stain.

The control of the degree of intoxication was found to be rather difficult as there is no accurate criterion for judgment. The best criterion was found to be the degree of loss of weight. Except in the cases of acute intoxication the thyroxin was not administered regularly by a certain dose at a certain time but was so spaced as to produce a slow but steady loss of weight. It was found possible to maintain a slow fall in weight until the last three or four weeks before death at which time the loss of weight became much more rapid though regular and terminated in exitus.

In the acute intoxication daily or twice daily injections were given. The 2 animals became restless, ceased to eat, lost weight (33 and 45 per cent respec-

tively) and died on the eighth and tenth days. In this time the total amount of thyroxin received was greater than that used in the cases of chronic intoxications with injections spread over from six to ten months.

In the chronic intoxications with small doses of thyroxin alone in 9 animals the loss of weight varied from 19 to 47 per cent. The hair of the head was lost especially in the cases of guinea pigs. Subcutaneous fat disappeared. The organs were hyperemic. Small pin point hemorrhages were found in the stomach but no ulceration.

In the 7 animals receiving both thyroxin and copper the progress was essentially the same as in the preceding group.

Complete protocols are given for all 18 animals. In summary the findings consisted of loss of weight and visceral changes in the liver, heart, kidneys, spleen, hypophysis, parathyroids and pancreas. In the heart and liver they were characterized by a richly vascularized fibrosis. In the liver the action apparently started at the periphery of the lobule and produced a parenchymatous degeneration of the cells similar to that produced by other toxic agents. There was a marked reduction in fat and almost complete absence of glycogen factors which probably preceded the degenerative changes. The fibrosis was probably preceded by a condition of serous inflammation, i.e. hyperemia, edema and degeneration without lymphocytic or leucocytic reaction. These effects were lessened by the simultaneous administration of copper.

The pancreas of the guinea pigs presented remarkable modifications. In the acute intoxication there was degeneration amounting almost to necrosis of the islets. In the chronic intoxication there was hypertrophy of the insular apparatus amounting to 2 or 3 times that found in the normal. The application of these experimental facts may indicate that the thyroid hormone stimulates pancreatic hyperplasia which in turn empties the liver of its reserves.

MAX M. ZIMMERER, M.D.

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A search through the literature of recent years on the subject of hypertension, especially relative to the surgical treatment of this syndrome, reveals a startling multiplicity of theories as to its cause and nature, and an equal or greater number of suggestions for its proper treatment. It is obvious that in a review of this nature all these hundreds of articles cannot be quoted or even referred to, but an attempt has here been made to bring together into a condensed form the present-day concepts concerning the nature of hypertension and its treatment by surgical means, as well as an interpretation of some of the more important experimental work which is being done. Time alone has proved the fallacy of many theories. Many reports were clearly without logical conception in their beginning. Much unjustified surgery has been done and is still being done, a condition which has existed, no doubt, in the early treatment of every perplexing disease entity in which surgery was employed. Worthless reports, carelessly conducted experiments, repeated theorizing without experimental basis, futile classifications, and other factors have produced such a complexity of ideas and confusion of purpose that until quite recently it seemed that the surgical treatment of hypertension offered little promise of help. It is encouraging, however, that the past year or two

finds some order arising out of the chaos, that collective thinking and agreement are occurring among surgeons, and that more and better experimentation is being done.

From some quarters come bitter criticisms against the use of surgery in the treatment of hypertension, and the usual argument is that treatment as radical as sympathectomy should not be employed for a *symptom*, of which the *cause* is still unknown. It is true, unfortunately, that the etiology of, or pathological basis for, hypertension is in the main unknown, but surgery has in many instances given undeniable relief where medical treatment has admittedly failed. By some men, mainly unsympathetic toward surgical treatment, hypertension has been postulated to be the result of high protein diet, emotional stress, obesity, the menopause, worry and overwork, tobacco, alcohol, "auto-intoxication," intestinal absorption of streptococcic toxins (Rose, 1933), goiter (King, 1933), gonadotropic-hormone imbalance, syphilis, hereditary influences, and dozens of other environmental and physiological factors. The individual physician has treated his patients according to his theory of the cause. Carbon-dioxide baths, mud baths, hydrotherapy, intestinal douches, various forms of rest, various forms of exercise, drugs of various and conflicting types, watermelon-seed extract (Althausen and Kerr, 1929), psycho-analysis (Menninger), diathermy (Gunewardene, 1933), active and passive movements of the spinal column (Cyriax, 1917), veratrum vende (Douthwaite, 1931), and even prayer have all been used by different clinicians, and, as might be expected, the reports of their success are often glowing with enthusiasm. Such an admixture of theory and irrational treatment necessitates no comment, and it leaves little ground for criticism of the efforts of surgeons to ameliorate the ill effects of hypertension, if they are treating only a symptom, so long as their surgical attempts are guided by careful clinical and experimental study of their problem.

EXPERIMENTAL INVESTIGATIONS

One of the greatest obstacles in the understanding of the nature of hypertension is the fact that the physiology of the autonomic nervous system

and of the endocrine glands remains incompletely understood. Experimental study on the problem of hypertension has been largely directed toward an elucidation of the function of the autonomic and endocrine systems alone with one another or with the rest of the organism and thus of course is no small undertaking. Germany, France, Italy, and South America have each produced a considerable volume of work on the study of experimental hypertension, but by far the most extensive and most productive of result has been the work done in the United States during the past four years. It is hoped that this present active interest in experimentation may lead to the optimal treatment of hypertension be it medical or surgical or a combination of the two, and some recent investigations are especially encouraging in this light (58, 176, 159).

Early animal experimentation was slow to produce results of practical value but it led directly to the type of present day experiments which are indicating according to some investigators, the nature of hypertension in the human subject (159, 174). There has long been an active interest in autonomic physiology among French and Italian investigators. Viale (14), using dogs, showed that the spleen is an organ which compensates readily for the rapid variations slight or large in arterial blood pressure, and he, together with Soncini (15), demonstrated that section of the vagus nerve causes the spleen of a normal dog to dilate greatly, which action does not occur in a dog when its spleen is denervated and that the reaction of adrenalin, rapid and forceful on the normal spleen, is slight and slow in occurrence in the denervated spleen. Later Reed and Layman (27) found that bilateral vagotomy in dogs resulted in a fall of the blood pressure which might show various accompanying heart rate changes, and they concluded that the post vagotomy hypotension was partly due to the removal of the pathway by which impulses reach the vasomotor centers. DeGroat, Davis and McDonald (45) produced hypertension in rabbits by the section of the vagi and denervation of the carotid sinus. This they believed was due to a resultant hyperreflexemia. Heymans and Bouckaert (33) reported that section of the carotid sinus alone in dogs produces a chronic hypertension with tachycardia and, occasionally, a fatal pulmonary edema. Danielopolu, Marcou and Proca (32) showed that occlusion of the thoracic aorta causes a rise of the blood pressure measured in the carotid arteries due to an increased contractile force of the myocardium and occurring whether the coronary arteries are

tied or not. However a heart with ligated coronary arteries will not show a capacity for this reaction when the sympathetic fibers to it are interrupted, as, for instance, in the removal of the stellate ganglion. Thus an altered myocardium does not readily tolerate the intervention of sympathectomy, and the authors explain that the accidents of acute myocardial insufficiency following stellectomy in anginal patients are due to the suppression of the nervous reserve. Danielopolu and Aslan (36), in contradistinction to Hering did not find a tachycardia or hypertension when bilateral neurectomy of the carotid sinus was done with section of the centripetal "cardio-aortic" bundles. Leiter and Grinker (61) working with a large series of cats, found no evidence of a superior hypothalamic center for the control of blood pressure. Stimulation of any part of the hypothalamus produced no rise in the blood pressure when other factors such as muscle action, were eliminated.

Thus down to 1934, there was scattered evidence of serious work aimed at the discovery of the physiological basis of blood pressure changes. Many of these efforts not reported here, were completely misdirected and the results eventually proved fallacious. However the interest in the matter was established, arm chair theorizing had for the most part stopped and the collective results of the preceding years gave promise and support to experimentation on the cause of hypertension and its alteration by various surgical procedures on the endocrine and autonomic nervous systems.

There is no doubt that Goldblatt and his associates (58) gave the initial impetus to present day animal experimentation when they began their study of the pathogenesis of hypertension by producing renal ischemia in dogs as well as in monkeys (123) with a resultant sustained arterial pressure. This pressure elevation was at first considered to be comparable to the hypertension of human nephrosclerosis inasmuch as it was accompanied by uremia and disturbed renal function when constriction of the renal arteries was severe. Their method, remarkable for its ingenuity is now widely known and used. It consists of the partial occlusion to any desired degree of the renal arteries in dogs which have been trained to have blood pressure readings made on previously prepared Van Leersum carotid loops. Small adjustable silver clamps and a special instrument for placing them were developed especially for this study, and on the 11 original dogs so prepared the results were uniform and constant. Uremic symptoms and

death occurred only when there was sudden, severe, bilateral clamping of the arteries with a resultant high blood pressure. Less severe constriction of both renal arteries produced in every animal a permanent rise in the blood pressure, with a lowered urea clearance as the only indication of impaired renal function. The dogs lived many months. In 1 animal, removal of one adrenal with denervation and medullectomy of the other was done before the application of the clamps. Following arterial constriction, there was a prompt, persistent rise in the blood pressure. Not necrosis, but rather trophic change, was found in the glomeruli, parenchyma, and vessels of the kidneys of these animals. In this article, the first of a series of reports of further studies of renal ischemia, the authors pointed out that the injection of nephrotoxic substances, irradiation of the kidneys, and partial renal excision, had all been tried without a resultant persistent hypertension. In subsequent reports Goldblatt postulated the existence of a "pressor" substance produced in and emanating from the ischemic kidney, thus placing the hypertension on a "humoral" basis. This argument has found many to support it, even among clinical investigators (82, 174), but others fail to see its justification, believing the pathogenesis of hypertension to be a much more complicated process (168).

Acceptable or not in all respects, Goldblatt's first reports represent the key experiments of most of the present animal experimentation on hypertension. Many workers are now using his method to produce and study hypertensive animals (79, 137, 120, 158, 153). Page (79), as well as Goldblatt (58), did not find the renal efficiency, as measured by the content of the blood urea, to be markedly altered in dogs with renal artery clamps, and he found that the renal efficiency bears no relationship to the height of the blood pressure. Furthermore, he found no significant changes in the plasma protein or lipoids. Freeman and Page (120) studied the peripheral resistance, cardiac output, and blood volume, as well as the part played by these factors in the genesis of hypertension in dogs prepared by the Goldblatt method. They found that complete sympathectomy (removal of the entire chain and all ganglia below the stellate) did not prevent the development of hypertension from compression of the renal arteries, that denervation of the heart combined with total sympathectomy did not influence the course of the hypertension; and that the plasma volume, in normal or sympathectomized dogs, was not increased as the hypertension developed. They concluded, therefore,

that a renal ischemia type of hypertension is not mediated through an increase of the peripheral resistance of reflex sympathetic vasomotor origin, and that it is the result of neither a reflex change in cardiac activity nor an increase of plasma. Page and Heuer (81) had earlier denervated the kidneys in a young female patient with severe hypertension, and found no effect on her arterial pressure. This cast doubt in their minds on the rôle of the renal nerves in the genesis of hypertension. Since then Page (79, 157) and others (Collins, 88) have pointed out that the function of the renal nerves is not necessary for the development of hypertension, and, yet, the results of the large series of cases reported by Peet (82, 121, 174) are believed by him to be due mainly to the release of renal-vessel constriction of nervous origin by means of sympathectomy. Using dogs, Goldblatt, Gross, and Hanzal (125) found that excision of the thoracic portion of the splanchnic nerves and the lower four thoracic sympathetic ganglia, on both sides, does not prevent, cure, or permanently lower in any degree experimental hypertension produced by renal ischemia, and they stated that they believed, therefore, with Page and Collins, that such findings minimize the importance of the splanchnic vasomotor mechanism in the pathogenesis of renal hypertension. These findings were verified later by Alpert, Alving, and Grimson (111).

Grimson, Wilson, and Phemister (127), also working with dogs, found that in normal animals six months, on the average, were required for the blood pressure to rise to normal after complete sympathectomy (from the stellate ganglion above to the hollow of the sacrum below). Peripheral vascular tone during the period of lowered pressure was dependent, they believed, upon an inherent vascular tone and not on central vasomotor tone, as shown by cord section at the level of the eighth cervical segment. They found no evidence of an increase in inherent peripheral vascular tone synchronous with latent restoration of the blood pressure to the pre-operative level. Glenn, Child, and Page, (157) using dogs prepared with Van Leersum carotid loops and in which hypertension had been produced by the Goldblatt method, sectioned the spinal cord at the level of the fifth cervical vertebra, and then pithed the cord. There was an immediate sharp fall in the blood pressure, well below any former recording, and this was followed by a gradual rise to a level above the average pressure before the renal clamps were applied. At no time did the pressure rise to the previous average hypertensive level. In some dogs which lived as long

as sixty one days after cord section this post-pathing rise tended gradually to fall again

Blalock and Levy (115) found that when hypertension is produced in dogs by partial occlusion of the renal artery of an explanted kidney the removal of the kidney under local anesthesia usually results in a slow decline of the blood pressure. Partial constriction of the artery to a single remaining kidney, denervated and explanted into the neck, caused a rise of the blood pressure in their animals. These authors confirmed the findings of Page and Heuer (80-81) in the human subject and believe that the findings of Prinzmetal and Wilson (102)—that anesthetization of the vasomotor nerves does not release the vascular hypertonicity in renal hypertension—as well as the observations of Goldblatt and his associates (94)—that splanchnic section does not prevent the elevation of nor lower the blood pressure produced by renal ischemia—show that this type of hypertension is not dependent upon the integrity of those pathways or the renal nerves. Using normal dogs in which the blood pressures have been accurately established Glenn, Child and Heuer (156) transplanted the left kidney to the groin keeping the ureter intact and re-established an arterial supply through the femoral arteries. This procedure alone caused no pressure changes. A right nephrectomy was then performed, also without effect on the blood pressure. The left femoral artery was then constricted by a Goldblatt clamp with a resultant rise in the blood pressure. These results indicate clearly that the renal nerves have no role in the initiation or maintenance of the hypertension of renal ischemia, and this report, incidentally covers what was apparently a reliable and well controlled piece of experimental work.

Goldblatt and Wartmann (126) could not prevent or reduce the blood pressure in dogs suffering from renal ischemia by section of the anterior spinal roots from the sixth thoracic to the second lumbar, inclusive. McCann (170) agreed with Goldblatt in that he was unable to prevent cure or permanently lower the hypertension of renal ischemia by excision of the twelfth thoracic sympathetic ganglion and the thoracic splanchnic nerves. Goldblatt concluded that it is not likely that this type of hypertension is due to any nervous reflex from the ischemic kidney or to any portion of the vasomotor system other than in the kidney itself. This strengthened their view that the hypertension of renal ischemia is on a humoral basis, being produced by a hypothetical effector substance of renal origin which causes arteriolar constriction (123).

On all this good evidence that an ischemic kidney probably produces a 'pressor' effector substance, whereas a normal kidney does not, Leatham (166) attempted to discover the presence of this hormonal substance in the urine of hypertensive patients. Urine from male and female hypertensive individuals, controlled by normal urine, was injected into normal dogs. There was no difference in effect on the dogs regardless of the source of the urine. Pickering (99) found that 'the changes in arterial blood pressure produced in anemic subjects by transfusion of blood from patients with essential hypertension are very small and that such changes are no greater than those produced by transfusion of an equal volume of normal blood. This report is opposed to the idea that the raised blood pressure in essential hypertension is due to excess of pressor or deficit of a depressor substance in the circulating blood.' These statements were the result of a large series of transfusions some of the donors having pressures as high as 240/130 mm.

Page and Sweet (137), using dogs prepared by the Goldblatt method reduced the pressure from 240/160 mm to 125/100 mm by hypophysectomy. They found no such response in normal dogs, and their results indicated that after hypophysectomy there is a reduction in the responsiveness of the blood vessels to chemical stimuli arising in an ischemic kidney. They raise the question, however, as to the possibility of the drop in pressure being due to a lack of adrenal or thyroid secretion. Glenn and Lasher (158) were unable to lower the hypertension of dogs with renal ischemia by means of total thyroidectomy. Such a procedure seemed not to affect either the production or maintenance of this type of hypertension.

In view of the possibility of the formation of a pressor substance in the ischemic kidney and the further possibility that this substance might be modified or destroyed by passage through the liver it seemed of interest to Child and Glenn (155) to determine the effect in experimental hypertension of the direct passage of blood from the ischemic kidney through the liver. The venous blood from the kidney passing into the inferior vena cava was shunted directly into the liver by means of an anastomosis with the portal vein. Two dogs in which this reverse Eck fistula was made had not yet had a hypertension produced by means of renal ischemia. Two other dogs had such a hypertension before the fistula was made. There was a slight elevation in the blood urea nitrogen for a few days in one dog postoperatively but not in any of the others.

The production of hypertension was not prevented by the fistula, and the hypertension already established was in no way affected (179).

By the severe constriction of the renal arteries in 17 dogs, Goldblatt (159) was able to produce a malignant type of hypertension. There was a great increase in the blood urea, non-protein nitrogen, and creatinine of these animals, and the urea and creatinine clearance tests indicated a great reduction of renal efficiency. Some of the pressures went as high as 300 mm systolic, with anal bleeding and blindness from intra-ocular hemorrhage. At autopsy many of the organs showed petechial hemorrhages or actual extravasation of blood with hyalinization and necrosis of the blood vessels. Goldblatt believes that elevation of the blood pressure, a mechanical factor, and renal insufficiency, a humoral factor, are at least two of the necessary conditions for the development of the necrotic arterioles and hemorrhages of malignant hypertension. "Necrotic arterioles and hemorrhages have not yet been observed in animals that have had a very high blood pressure for years without renal insufficiency, nor in animals with azotemia, due to the removal of both kidneys, but without hypertension. Hyalinized retinal arterioles have been observed in dogs with persistent hypertension and with moderate or no disturbance of renal function. That ischemia is not the cause of the necrosis of the arterioles is shown by their absence from the ischemic kidneys of the dogs and their wide-spread presence in the organs that were not ischemic. These experiments show that the necrotic changes and the hemorrhages are secondary to and not the primary cause of the malignant phase of hypertension." He also stated that the hypertensive kidney of man often does show arteriolar necrosis, but in dogs the intravascular pressure in the kidney is probably low because of the clamp, while in human beings it is high because of sclerosis and constriction of the preglomerular arterioles.

Through the continued efforts of Heymans and his co-workers (33, 74), as well as of several other French physiologists, there has been sustained an interest in the study of hypertension produced by denervation of the carotid sinus and destruction of the "cardio-aortic moderator" nerves. Working with dogs, Heymans and Bouckaert sectioned the depressor nerve to the heart and performed a neurectomy of the carotid sinus, and produced a hypertension which did not respond permanently to splanchnic sympathectomy alone, to adrenalectomy, or to lumbar ganglionectomy. They believed a complete removal of the

sympathetic system to be necessary in order that such a hypertension be overcome. Davis and Barker (153) believe that such a hypertension may be similar to the occasional clinical case which presents a labile blood pressure, but that it does not correspond to the more common type of clinical hypertension. Green, DeGroat, and McDonald (73) denervated the carotid sinus and sectioned the vagus cardiac fibers in 9 dogs, with uniform results. Their operation was followed by an unstable increase in the blood pressure which gradually levelled off to slightly above the pre-operative normal. Tachycardia resulted, as in Heymans' animals, and there was an occasional death from cardiac failure. They believed (72) that the failure of this hypertension to maintain itself was the result of an adaptation of the cardiovascular-sympathetic mechanism rather than a regeneration of the carotid sinus and aortic depressor nerves. Leriche (98) and his associates, producing hypertension in dogs by this method, were unable to lower the pressure effectively by total adrenalectomy, or by the removal of one adrenal gland and subtotal removal of the other. Pickering, Kissin, and Rothschild (101) agree with Davis and Barker in their opinion that the hypertension of patients in the "essential" group, or those suffering from nephritis, is different in origin from that produced experimentally by the method of Heymans and Bouckaert.

Hermann and Jourdan (128) reported that the stimulation of the cephalic end of the cervical sympathetic nerves of a dog causes the passage into the blood of a vasoconstrictor substance, the dog's adrenal glands having been decapsulated. The vagi were sectioned at the base of the skull and the lower cervical thoracic and lumbar cord was destroyed. Therefore, no sympathetic reflex through the cord was possible. Furthermore, the glomus caroticum was resected. The authors hold this study to be supportive of Cannon's old theory (1) of sympathin formation on sympathetic stimulation (147).

Lately some very significant experimental work has been turned out, furnishing results dealing with the rôle of adrenalin in hypertension apropos of certain current forms of surgical treatment of clinical hypertension. Prohaska, Harms, and Dragstedt (138) produced a sustained hypertension in dogs for as long as two weeks, by continuous intravenous injection of epinephrine. The amount sufficient to do this caused the death of the animals through a severely deranged metabolism following the hormonal effects of the treatment, and the authors therefore believed that it is not likely that a persistent hypertension

in man is due to hyperadrenalinemia Rogoff, Marcus, and others (170, 177, 178) reported exhaustive quantitative studies on the output of epinephrine from the adrenal glands of dogs, and on its disappearance from the systemic circulation after the intravenous injection of various amounts. Their results support those of Dragstedt and his associates (138, 119). Rogoff found evidence against the probability of an autogenous continuance of adrenal secretion produced by circulating epinephrine. He found also that epinephrine disappears rapidly from the systemic blood when it is introduced into the circulation in amounts equivalent to those liberated by the adrenal glands under strong stimulation. 'Unless it can be proved that there is an impairment in the capacity for removing epinephrine from the circulation in hypertension it is highly improbable in the light of these quantitative observations (176) that hypersecretion of epinephrine by the adrenals and presence of epinephrine in the systemic circulation in concentrations capable of producing a persistent elevation of blood pressure can be the cause of chronic hypertension.' Rogoff and his collaborators believe that many of the reports in the literature regarding the amounts of epinephrine in the circulating blood of hypertensive individuals are grossly exaggerated and calculated by improper methods of assay. In dogs suffering hypertension from renal ischemia they found no increase of epinephrine, and they point out the fact that Goldblatt (58) in his early experiments was able to produce chronic hypertension by renal ischemia in dogs after the excision of one adrenal gland and the denervation of the other with mechanical destruction of the medulla. Such hypertension therefore must be independent of the secretion of the adrenal glands (147).

However Goldblatt later reported (154) that bilateral adrenalectomy eliminates completely the response to constriction of the renal arteries and found evidence to indicate that the cortex of the adrenal glands was necessary to the development of the hypertension. He believed there was a definite relationship in which cortical secretion and the hypothetical renal effector acted together to produce and maintain the hypertension. These results were later confirmed and amplified by Page (172) who showed that the adrenal cortex or the administration of its extract in substitution therapy was necessary for the production and maintenance of the hypertension of renal ischemia. Page further showed that hypophysectomy may decrease the vascular response to the constriction of the renal arteries, but it does

not prevent hypertension even in the absence of replacement treatment. In 4 experiments, the removal of the gonads in either male or female dogs did not appear to modify appreciably the hypertension once it was established.

Walter and Pijoan (141) produced a pressure of 242/130 mm in a dog persistent for many months by nicking the posterior hypothalamus. They found no retinal changes of loss of elasticity of the vessels as shown by nembutal anesthesia. This hypertension was obviously of a more labile type than that of dogs with renal ischemia.

THE NATURE OF HYPERTENSION IN HUMAN SUBJECTS

Hypertension may be produced in animals in a number of ways, but the question has been

How can the results of animal experimentation be evaluated so as to elucidate the cause and treatment of hypertension in human beings? The importance and difficulty of this correlation is voiced by several modern investigators (133, 167, 143). Karsner states (164) that the observations in experimental animals and in man from the clinical side give no support to the view that essential hypertension is different from renal hypertension. He believes that degenerative processes are to be found in any and all hypertensive subjects.

The complete pathological picture as well as the cause, of hypertension still remains unknown in human hypertensive individuals. The importance of this knowledge was emphasized by Keith and Kernohan (23) as early as 1930. The effect of animal and vegetable diet on the blood pressure of man was studied by Baile (28) who observed various orders of monks whose diets varied according to their rules, but he was unable to reach any definite relationship between diet and blood pressure. Lhermitte (24) believed that he recognized a case of hypertension in a patient with an inflammatory lesion of the gasserian ganglion which was due to the involvement of the hypothalamic and brain stem vasoconstrictor centers through the ascending and descending pathways of the fifth nerve. Raab (41) gave experimental and clinical data to indicate that a possible cause of either essential or arteriosclerotic hypertension is a vascular disturbance of the cerebromedullary vasomotor centers following atherosclerosis, arteriosclerosis and perhaps spasms of the basilar blood vessels and their branches. Spark (83) found no morphological evidence to support the hypothesis that essential hypertension and the hypertension of eclampsia gravidarum are due to a hyperactive

tion of the neurohypophysis by an increase of basophilic cells. In post-mortem studies of a large series of patients in which there were 70 with essential hypertension, 11 with an antecedent hypertension and 108 with no hypertension, there were no differences in degree of basophilic invasion of the pars nervosa when groups of the same ages were compared. In 1934 Cushing (55) reported several cases of hypertension with marked pituitary basophilism. In eclamptics he had found anterior-lobe basophilism with an overflow of basophils into the posterior lobe. Leary and Zimmerman (132) concluded after a study of the pituitary glands in 153 cases that "significant" basophilic infiltration is much more common in hypertensive than in non-hypertensive patients, and more common after the age of forty. Pickering and Kissin (100), contrary to the belief of the DeCourcy Clinic (70), concluded that patients with chronic nephritic hypertension were not abnormally sensitive to circulating adrenalin, and they found no evidence to support the view that essential hypertension is due to hyperadrenalinism. They confirmed, therefore, the more recent reports of Dragstedt, Rogoff, and their associates. Further examples of disagreement as to the rôle of the adrenal glands could be cited.

American surgeons, while attempting to determine the cause of hypertension, are immediately concerned with the employment of reliable criteria for the selection of cases for surgical treatment. This need has been repeatedly voiced by surgeons at the Mayo Clinic (86), by Leriche (168), and recently by Davis and Barker (153). An agreement has not yet been reached as to what constitutes a reliable method for the determination of cases suitable for surgical care. Even hypertension itself is not defined alike by all, and although classifications (21, 130, 134, 160) have been attempted, they have failed to clarify the origin or nature of the syndrome of hypertension. Livingstone (78) accepted 150/100 mm as the highest pressure which could be considered normal. According to Davis and Barker (153) essential hypertension is a disorder with one or more etiological factors, in which the blood pressure is over 160 mm systolic and 90 mm diastolic. DeCourcy (57) compared hyperthyroidism to hyperadrenalinism, i.e., hypertension, which he believes is due to an overactivity of the adrenal glands, and he bases his treatment accordingly. Crile (151) recently defined essential hypertension as a "pathologic physiology of the mechanism that governs the diastolic and the systolic blood pressure," and he considers it

primarily a "pathologic physiology" of the aortic complex and celiac ganglia (118). Brown (68) voiced the general belief of the Mayo Clinic group when he stated that essential hypertension is on a neurogenic basis, that it is a manifestation of exaggerated vasomotor response, and that 85 per cent of the patients suffering from essential hypertension have a familial history of the complaint. Peet (82, 174) agrees that essential hypertension is neurogenic in origin.

THE FORMS OF SURGICAL TREATMENT

Following the early investigation of Jean (2,3), Danielopolu (4), Pende (5, 7), Bruening and Stahl (6), Rowntree and Adson (8), and Pieri (9, 40), there has been a constantly growing interest in the possibilities of the surgical treatment of hypertension among continental European and American surgeons. This interest, sustained by encouraging results in the research laboratories, is keen and active because of the increasing importance of hypertension among the more formidable disease entities and because of the high mortality it produces in spite of the best medical care. But surgeons have met with repeated warnings and criticisms from those who would continue with the conservative measures of rest, re-education in living habits, and medication (19, 25, 29, 46). Wilson (142) stated in 1937: "The most important factor in the prognosis and treatment of hypertensive disease is not the height of the blood pressure, either systolic or diastolic, but the degree of arteriolar and arterial sclerosis especially in the coronary arteries, and in those of the cerebral and renal areas, and the consequent dysfunction due to oxygen and nutrient deprivation. Treatment directed chiefly toward the reduction of the blood pressure consequently does not rest upon a reasonable basis, and may be harmful."

There are innumerable reports in the literature of hypertension cured by means of the removal of adrenal tumors (12, 26, 20, 42, 67, 51, 62, 145, and others), but this type of hypertension is paroxysmal and not to be confused with the commoner, less well understood "essential" and "malignant" types of the symptom. In the presence of our lack of understanding of the cause and nature of either form—and it is obvious from the various conflicting reports that this is so—and because there has never been a general acceptance of criteria on which to select patients for surgical treatment, the measures employed have been varied to the extreme, often unwarranted and irrational, and in some instances based on little or no reliable clinical or research data.

Garot (10) of the University of Liege, did not find that ultraviolet radiation had any manifest action on the blood pressure of infants. He cited his negative results in the face of reports from others that ultraviolet rays exert a hypotensive effect on the blood pressure. Henriques (11, 17) applied radium over the temporal area in order to reach the basal ganglia and thus lower the blood pressure of his patients. Critics pointed out at the time of his report that such a method was without scientific or rational basis and the wonder is that such a peculiar form of therapy was ever conceived. Henriques offered no explanation of the rationale of his treatment, but time and results have proved the fallacy of such a procedure. Bisset (22) reported a series of 6 patients suffering from hypertension whom he treated with rectal douches of sulphur water on the reasoning that the solution was bactericidal and the removal of 'pressor substances' from the colon might thus be effected. His results were not startling. On the theory that pituitary and/or adrenal hyperfunction or dysfunction causes hypertension Hutton and his associates (59, 152) have made several reports of patients treated by the application of x rays over the pituitary and adrenal areas and they report that treatment has been effective in 75 per cent of their cases of essential hypertension in that symptomatic relief was obtained whether or not there was a fall in the pressure. These results however do not seem to enjoy popular acclaim. Chabner (87) reported the effective lowering of the blood pressure in patients with hypertension and glomerular nephritis by derapulation and denervation of the kidneys.

The past three years have seen a decided turn away from so much diversity of thought, theory, and surgical attempt. The state of complete agreement between surgeons as to what constitutes the optimal surgical treatment lacks much of its ideal attainment but clinical and animal research is more and more being directed in such a way as to narrow the line of attack and concerted action by large groups of surgeons brings out monthly greater promise of relief for the hypertensive patient. Modern surgical treatment, according to the trends both in America and abroad may be classified under three types of operation: rhizotomy, adrenalectomy, and sympathectomy. All other current forms of surgical treatment are greatly in the minority and they are receiving little notice because of lack of support by either clinical results or experimentation in the laboratory. Even rhizotomy, used in this country only a few years ago has

already been discarded by most of its former adherents.

Rhizotomy. Because the results on the blood pressure and the ultimate outcome following removal of lumbar ganglia Nos. 2, 3, and 4 with the intervening chain were not significant Adson (8) believed that not a large enough area had been denervated. So in order to secure complete sympathectomy below the diaphragm he performed, in 1930 (48), a bilateral section of the anterior and posterior roots, from the sixth thoracic to the second lumbar, inclusive. The pre-operative pressures were not given but post-operatively the pressure ranged from 140 mm to 160 mm systolic and from 80 mm to 110 mm diastolic. There was a complicating postoperative hemorrhage which caused cord changes and masked the physiological results of the sympathectomy. In the report of a case of hypertension treated by anterior rhizotomy from the sixth thoracic to the second lumbar roots, inclusive the pressure was said to fall from 140/160 mm pre-operatively to 180/120 mm after the root sections. There was no sweat response below the subternal notch, but there was still some response to the cold pressor test below the diaphragm. Adson (48) was encouraged by this result, believing that it demonstrated the necessity of paralyzing the anterior abdominal wall to reduce the intra-abdominal pressure. Brown, Craig, and Adson (69) reported later a series of 8 cases treated by bilateral anterior rhizotomy from the sixth thoracic through the second lumbar roots, with an effective, permanent depression of the blood pressure. In fact the upright posture caused such a terrific sudden drop that abdominal binders were necessary in some cases. Leriche frankly criticized such 'debilitating and mutilating operations and saw no point in 'cutting a disease by crippling the patient'. Page and Heuer (95, 136, 139, 171) reported on a series of 20 patients treated by sections of the anterior roots whose conditions varied from benign essential to almost highly malignant hypertension. They considered abnormal vaso-spasm particularly of the splanchnic arterioles to be a more important cause of hypertension than either hypophyseal basophilism or hyperadrenalinism. The operations in this group of patients were attended by three severe complications including two deaths. Heuer found that anterior rhizotomy did not produce more than a 25 per cent reduction of the pre-existing pressure possibly because of the variability of the severity of the disease in different individuals. He found that in some cases the pathology about the eye cleared up very

well and the heart decreased in size, but that the renal function was not changed. In the selection of cases several criteria were used. The flexibility of the vascular tree was determined by the fall in the blood pressure when the patient was put to bed, by the fall of pressure after the intramuscular injection of colloidal sulphur or of acetyl-beta-methylcholine, after the administration of sodium thiocyanate by mouth, or after the inhalation of amyl nitrate, and especially by the daily fluctuations in the level of the blood pressure as determined by a long period of observation. Evidence of cardiac and renal damage, as well as fundus changes, were used to determine the degree of advancement of the hypertension. Heuer (95) placed little significance on the paralysis of the anterior abdominal muscles, and found the abdominal enlargement neither unsightly nor disabling. Page (171) felt that the best results were obtained in malignant hypertension and that essential hypertension could still be best treated medically.

A procedure comparable in result to anterior rhizotomy was done by Abelson (47) for the relief of hypertensive crises when apoplexy was imminent. This was the injection of normal salt solution around the anterior roots, outside of the arachnoid, the effects of which might last several days.

Adrenalectomy. On the assumption that hypertension is the result of the over-activity of the adrenal glands, the partial removal of the normal organs has been practiced by various foreign surgeons, mainly French, and by the DeCourcy Clinic in Cincinnati.

Galata (16) removed one suprarenal gland in a woman suffering from a "menopausal hypertension" and secured a drop in pressure from 280/150 mm or 300/160 mm to 180 mm or 190/100 mm, which was still present with subjective improvement at the end of six months. Meillère and Ollivier (63), in a review of current trends in the treatment of hypertension, were impressed by the effort concentrated against the adrenal glands or against their secretory nerves, looking with favor on subtotal adrenalectomy rather than on denervation of the gland, but they warned of the dangers of such interference with the vital organs. They believed DeCourcy's partial bilateral adrenalectomy to be the operation of choice for malignant hypertension. They reported earlier (65) that the partial removal of the adrenal glands for essential hypertension was dangerous, ill-advised, and without results sufficient to warrant the risks incurred. Langeron and his associates (66) believed surgical treatment

to be warranted only when the pathological seat of the hypertension could be removed, and encouraged adrenalectomy if a tumor were present or if hyperactivity or hyperplasia of the gland could be demonstrated. They warned particularly against a sudden operative drop in the pressure. Monier-Vinard and Desmarest (64) reported 2 cases of far advanced hypertension treated by complete removal of the right adrenal gland, with improvement subjectively and clinically. The reports were made at the end of one year and four months respectively, and both cases had had extensive pre-operative study so that the organic changes present were well recognized. Leriche, Hermann, and Martin, P. E. (76) treated a case of malignant hypertension unsuccessfully by unilateral adrenalectomy, even though the gland showed hyperplasia. The same year Leriche and Ravault (77) reported that the removal of a normal left suprarenal gland in a patient suffering from an advanced essential hypertension resulted in a "permanent" cure. The pressure averaged 250/145 mm, cardiac changes had occurred, and there were marked subjective complaints, all of which were relieved by the operation. Here, as later (168), Leriche stated that he believes the solution of the problem of hypertension lies in the eventual understanding of the hormonal (adrenal) factor, and that clinical, rather than animal, experimentation will bring about the solution. His best results have been obtained by unilateral adrenalectomy and lumbar ganglionectomy on the same side, at one stage, followed later by a splanchnic resection on the other side, with or without ganglion ablation. Leriche (169) reported early in 1938 a case of hypertension treated with left splanchnicectomy and left total adrenalectomy, in which the pressure fell from 200/120 mm. to 160/90 mm. with good subjective results which were still present after fourteen months.

In an early report (57) DeCourcy compared subtotal thyroidectomy for hyperthyroidism to bilateral subtotal removal of the adrenal glands (in two stages) for hypertension. He believed actual removal of the tissue was necessary because of the presence of adrenal hyperplasia and hyperactivity, and therefore believed that splanchnicectomy alone, or adrenal denervation, was ineffective. He was criticized by Ayman (49) because of the shortness (one week) of his pre-operative period of observation of his patients. By August, 1934, DeCourcy (56) had operated upon 8 patients "for the relief and cure of essential hypertension." In all of the cases the operation was done under spinal anesthesia, in

two stages through a kidney incision and about one fourth of each gland was left. He accounted for the drop of from 70 to 90 points systolic and from 40 to 50 points diastolic by the removal of hyperplastic medullary tissue, which under constant sympathetic stimulation poured excessive amounts of adrenalin into the blood. He reported no complications. In 1933, he stated (70) that it was an accepted fact that essential hypertension is due to the increased adrenalin content of the blood and he postulated that in those cases in which the pressure rose again post-operatively, it was due either to a regeneration of the adrenal glands or to accessory pheochromic tissue masses elsewhere in the body. He believes (71) that the cases chosen for adrenalectomy require an early diagnosis, and that this can be made by means of fundus examination, study of the blood chemistry and tests of the renal function. If there is any alteration in the eye grounds, a considerable drop in the renal function, or pathological changes in the blood chemistry, he does not operate. His operations are done from two to three months apart and during the interval a compensatory hypertrophy is believed to occur in the gland which is subtotally removed at the second operation. From one fourth to one fifth of each gland is usually left which amount he believes is within the limit of safety. He points out that at this same operation the gland can be denervated if its capsule is stripped to the hilus and the nerves which are thereby laid bare are cut.

Sympathectomy. The best clinical results which are being obtained at the present time judging by reports follow one of several types of sympathectomy. This may be adrenal denervation by coelectomy as done by Crile or by splanchnic nerve resection (operation of Pende) as practiced by Peet, the Mayo Clinic and others.

Crile is the outstanding advocate of coelectomy for the treatment of hypertension (89, 90, 91, 119, 149, 150, 151). Much of the argument for his form of treatment is based on conclusions drawn from comparative anatomical studies, much of it is teleological and much of it is not accepted as sound or rational by his critics. He stated that it is known that in essential hypertension there is no demonstrable pathologic change in any organ or tissue except such as arise as a result of the disease in particular, those in the blood vessels, the heart and the kidneys. That is, essential hypertension is not caused by a pathologic morphology. It must then be due to a pathologic physiology and the only tissue in which a pathologic physiology can be developed is nerve tissue. Essential hypertension therefore must

be due to a pathologic physiology of that nerve tissue which is chiefly directly concerned with the control of the diastolic and systolic pressure and the force of the heart beat, which means that part of the sympathetic complex most immediately related to the arterial tree, namely the aortic complex and the celiac ganglia. Early in his surgical treatment of hypertension he too practiced adrenalectomy, but he found that it alone was not effective and that the adrenal sympathetic mechanism which also has to do with the circulatory rate of the blood must be attacked as the source of the disease. He looks upon the adreno-celelic aortic complex as the 'energy-controlling system' of the body and believes that the purpose of coelectomy is to depress the function of this system.

Crile's operation consists of a lumbar incision with insertion of the hand down to the aorta. The field of operation is not visualized but instead a touch anatomy is used to locate the desired ganglia and their nerves which method provides a three dimensional value and a certainty of identification which is not possible by sight and instrumentation. He believes visualization is not feasible, and in his operation, which requires from fifteen to twenty minutes blunt finger dissection is used to free the celiac ganglia and aortic nerves.

By June, 1938, he had performed 308 such operations on 233 patients suffering from essential hypertension. One year or more after surgery 87 per cent of the patients are relieved and 33 per cent have complete relief. Of 15 cases of malignant hypertension 75 per cent show favorable results after one year. Malignant hypertension was found to be no contra indication to surgery, since there was nothing to lose by operation and the prognosis was poor under any treatment. The one important result of operation to Crile is a betterment of the patient's subjective complaints. Increased diastolic pressure changes in the eye ground, a drop in the kidney function and the patient's story of his disability and distress are the most valuable indications by which essential hypertension can be diagnosed. Sclerotic changes are no criteria. The age of the patient, the duration of the disease, the condition of the heart and the good or bad effects of edation never constitute under any conditions contra indications to celiac ganglionectomy, but impaired kidney function may in some cases be a contra indication to operation. Crile believes (150) in disagreement with Leriche (96) that a diagnostic novocaine block of the splanchnic nerves is a dangerous procedure.

Rogoff and his co-workers (176, 177, 178) decry the employment of such radical surgery. They warn of the dangers of adrenal insufficiency in any "tampering" with the adrenal glands. Roentgen treatments to the adrenal glands are definitely dangerous. With regard to irradiation of the hypophysis, as well as of the adrenals, they point out that if it is assumed that an interrelated function between the hypophysis and the adrenal medulla is involved in such therapy, it is without any experimental or clinical proof, and that the experimental basis for intervention at the hypophysis in the treatment of hypertension is even less substantial than intervention at the adrenal glands.

Of interest in connection with the Crile operation is the observation of Ivy (163) that "to those who would denervate the adrenals for the treatment of various diseases, the report (131) that the adrenal nerves of cats regenerate in four months, even after the removal of the lower thoracic and upper lumbar sympathetic chain, will be of interest."

Surgery having to do with removal of the splanchnic nerves and the lower thoracic and upper lumbar chain, with or without an attack on the suprarenal glands, has been given serious trial for several years, and, in spite of poorly controlled clinical experiments, occasional reports of questionable authenticity, and adverse criticism by many internists and surgeons, this form of surgical attack on the problem of hypertension is rapidly growing in popularity, and if one may judge by the results stated in the reports, it is offering more hope for a solution, on a sounder physiological basis, than any other form of surgical therapy yet devised.

This operation is usually credited to Pende (5, 7), but it was first suggested in 1923 by Danielopolu (4). Basing his action on the influence of the splanchnic nerves on the secretion of the suprarenal glands, shown by him on animals since 1903, and on the vasoconstrictor action of the splanchnic nerves in the abdominal vascular tree, Pende proposed, in 1924, a surgical treatment for hypertension which consisted of interrupting two links, the nervous and the hormonal, in the supposed pathogenic chain, i.e., hyperexcitability of the splanchnic nerves and exaggeration of the adrenal secretion. This work was reviewed by Santucci (43), who on his own records stated that up to that time (1932) Pende's operation had proved the most efficacious form of surgical treatment. In answer to the ever-present question of whether it is safe and physiological to lower the blood pressure of hypertensive

patients, Santucci answered emphatically in the affirmative. Pieri (9, 40) was among the first to develop the technique of section of the splanchnic nerves, together with lumbar ganglionectomy. Pieri's operation of left-sided splanchnicectomy was later criticized by Adson as valueless because the adrenal glands were thereby incompletely sympathectomized. Meillère and Olhvier (63) in a long and comprehensive review of the French literature indicate that the adrenal factor is considered of prime importance in the treatment of hypertension, and the interest of French surgeons has mainly centered around ways and means of decreasing the adrenal function. These two investigators believe that celiacotomy is probably more effective, but they favor splanchnicectomy because of its relative ease of accomplishment, not overlooking, also, the good results obtained by splanchnicectomy. Durante (37) likewise advocated the Pende method. Pereira (18) reported that Pieri resected the tenth, eleventh, and twelfth ribs in order to perform an intrathoracic, posteromedial splanchnicectomy. Rossi's technique (13) was much the same. It was Pereira who proposed subdiaphragmatic section of the splanchnic nerves in order to avoid the dangers associated with the thoracic cavity and mediastinum. Baumgartner and Harvier (113), following the original technique of Pende, sectioned the left splanchnic nerves in a fifty-two-year-old woman with a true essential hypertension. A fall of pressure from 260/130 mm to 170/110 mm was effected for two weeks, but then the pressure rose to its original height. Hypophyseal and adrenal irradiation did not affect her. The authors point out Tournade and Chabrol's demonstration that each of the adrenal glands is bilaterally innervated and that therefore unilateral section is useless. Hermann and Sabadini (129) believed that no more than a temporary lowering of the blood pressure was ever obtained by even bilateral splanchnicectomy. Hermann and his group (161) reported in 1938 that while working with dogs they obtained proof that Pende's unilateral operation never was justified, and that they see no reason for the choice of either side alone. They believe that any splanchnic resection is poor surgical treatment and favor adrenal resection to adrenal denervation in any form, although they do not state that they have found hyperadrenalism to be a cause of permanent hypertension. Ciceri (116) is a staunch supporter of Pende's original principles, except that he uses the technique of Donati, which is a lumbar, subdiaphragmatic, extraperitoneal approach to the splanchnic nerves. In reviewing its

adoption he points out that Pende's operation is used with modifications in Italy by Pieri, Durante, Donati, Ciceri, Stropini, Mingazzini, Alessandri, Valdoni, and Paolucci; in America by Peet, Adson, Craig, and others; in France by Camolat, Langeron, Vincent, Desorcher, Fontaine, Lenche, and Jeanneney; and in Roumania by Janu. Ciceri does not agree with the criticism of Hermann (129, 161); he believes the operation is justified if sustained by clinical results, regard less of any animal experimentation. Lenche (168), however, is not entirely willing to accept splanchnicectomy; he believes the pathological basis of essential hypertension will be found in abnormal adrenal function, and discredits the value of the application of Goldblatt dogs to human hypertension.

The American literature contains a great many reports of small series of cases of hypertension treated by sympathectomy alone in combination with other forms of neurological approach and by nephrectomy (75, 85, 103, 139, 174, 140, 122, 153, 144, 162, 146, 165). Naturally the results in so many different hands have varied widely. The two largest American series are those of Peet and the Mayo Clinic, whose results have become increasingly full of promise. Whether one will accept or refuse the arguments for the surgical treatment of hypertension, one cannot fail to be impressed by these large series of cases by the surprisingly good results and by the apparent honesty of the reports.

Peet (82, 93, 121, 173, 174) was the first man in America to do a bilateral intrathoracic resection of the splanchnic nerves for hypertension, and his present technique varies but little from his original method. Through paravertebral incisions a small portion of each eleventh rib is resected, the pleura retracted, and the sympathetic chain ganglia and splanchnic nerves are identified. The lower few centimeters of all three splanchnic nerves are resected, and the chain and ganglia from the tenth ganglion downward to the diaphragm are removed with sectioning of the rami from the tenth, eleventh and twelfth intercostal nerves. Both sides are done at one sitting, the entire operation requiring about one hour. The series of Peet and his associates now totals more than 400 cases, some of them showing a persistence of clinical cure or great amelioration of symptoms for as long as five years.

This investigator is greatly impressed by the implications of Goldblatt's studies. He is convinced that the majority of his cases of hypertension have been due to an ischemia of the kidneys secondary to persistent vasoconstriction on a

neurogenic basis, and he believes his good results have been obtained because by sympathectomy nervous overactivity has been depressed—the 'nervous clamp' has been removed from the renal vessels. He recommends surgical intervention when the patient is fifty years old or younger, the systolic pressure is 200 mm., the non-protein nitrogen not over high normal, urine concentration 1:100 or over, the urea clearance above 30 per cent, the heart still compensated, and the patient has the clinical signs of headache, vertigo, weakness, and failing vision. Medical treatment having been tried, he believes that surgical intervention may be imperative if ocular changes are advancing and cerebral and cardiac damage is imminent. He has found no test which preoperatively will definitely indicate a permanent lowering of the blood pressure after splanchnicectomy. He has found that renal efficiency is not harmed by splanchnicectomy, in contradiction to the compensatory theory of renal function in hypertension, but on the contrary, many cases have shown improvement or complete return to normal in renal efficiency after operation. In these conceptions he is supported by other reliable investigators (66, 81). In brief, Peet's purpose in the surgical treatment of hypertension is to lower the blood pressure, improve renal function, and give the patient symptomatic relief by: (1) diminishing the peripheral blood volume through splanchnic dilatation; (2) diminishing the adrenal function; and especially, (3) abolishing abnormal vasoconstriction effects on the kidney, provided sclerotic changes in the kidney are not already too far advanced.

Surgeons and internists alike at the Mayo Clinic have been prolific and for the most part enthusiastic in the reports of their experiences in the surgical treatment of hypertension (8, 38, 46, 48, 53, 52, 54, 68, 69, 84, 86, 96, 103, 106, 107, 108, 117, 109, 120, 148, 144, 143). Beginning with a trial of the original Pende operation, then rhizotomy, and then a gradual development of their present technique, their history in this field of therapy is one of persistent effort and optimism. The operation which is practiced at present and advocated by Adson, Craig, and other surgeons of the Clinic staff consists of a subdiaphragmatic extraperitoneal bilateral resection of the splanchnic nerves and a removal of the upper two lumbar ganglia with the intervening chain. This procedure they believe completely denervates the splanchnic vessels, the adrenal glands, and the kidneys. Their series is now a large one—somewhat less than that of Peet, however—and they have on record patients who

are enjoying relief from symptoms for more than three years after operation.

The Mayo group accepts the neurogenic theory of the cause of hypertension, believing the syndrome to be due to a hypersensitivity of the vasomotor mechanism in certain individuals. The purpose of their operation, therefore, is to block the vasospastic impulses to the splanchnic area and to dilate the splanchnic vessels so as to create a safety reservoir when vasoconstriction occurs elsewhere, to decrease the liberation of epinephrine, and to increase the renal blood supply. They have been concerned especially with the problem of the proper selection of cases for surgical care, and various pre-operative procedures have been put to use. Hourly blood-pressure readings are taken for twenty-four hours with the patient at bed rest, the effect of sodium pentathal given intravenously, and of sodium amytal and sodium nitrate given orally is noted, and the effects of spinal anesthesia and avertin have been studied. A test very much in favor is the so-called "cold pressor" test, first described by Hines and Brown (38, 68, 96), and later criticized by Pickering (100) and Reid and Teel (175). They realize that no one criterion is absolutely reliable, and Adson has remarked that the cases giving favorable results pre-operatively very often are the ones showing the less satisfactory operative results. Sequelæ of their operation may be the loss of sweating on the feet and lower legs, permanent increase of the skin temperature on the lower extremities, paralysis of the ejaculatory powers due to a weakness of the muscles of the urogenital trigone, and sterility in the male without loss of libido. There is no alteration in menstruation or in childbearing function, and no sphincteric disturbance occurs in either sex.

In contradiction of Wilson's (142) remarks, Adson and Allen state "Failure of attempts to lower the blood pressure of patients who have hypertension has led to faulty reasoning and to explanations as to why the blood pressure should not be lowered in cases of hypertension. As we shall demonstrate later, it is not dangerous to lower blood pressure in cases of hypertension, in fact, such an accomplishment is highly desirable." Later they stated: "The failure of sympathectomy to lower blood pressure uniformly in any case of hypertension indicates that sympathetic control is not removed from a sufficiently large vascular bed by extensive sympathectomy, that the blood supply to the kidneys is not increased adequately, or that some mechanism inherent in the arterioles is responsible for the elevation of the blood pressure."

Allen and Adson (143) recently answered some current objections to the surgical treatment of hypertension in the light of their own experiences. They cannot correlate the experimental data obtained from the study of Goldblatt dogs with the information known concerning the pathogenesis of human hypertension. They state, further, that there is no clinical evidence to indicate that those parts of the body not influenced directly by sympathectomy, as the heart and brain, suffer a diminished blood flow after splanchnic dilatation. In fact, the retinal vessels show a marked improvement. There is no clinical evidence, either, that structures in the area dilated have to continue to function in a state of hyperemia. They flatly refute the evidence of Prinzmetal (102), that there is no increase in the vascular tone in hypertension, that the hypertonus is inherent in the vessels themselves, and that the hypertonus does not result from an overactivity of the sympathetic nerves. Their clinical results indicate the exact opposite. They operate to reduce the pressure by dilating a large splanchnic reservoir, not to denervate the local splanchnic area as a specific area in need of sympathectomy. They realize the fact that their results have not yet withstood the test of adequate time, but they have been encouraged by them enough to insist that the surgical treatment of hypertension deserves unbiased consideration and further trial.

CONCLUSION

The present day marks a critical stage in the treatment of hypertension. Some reviewers apparently do not deem surgical treatment of hypertension worthy of mention (25, 30, 35), others (19, 31) question the validity and worth of some of the published reports (a point no doubt well taken!), some (29, 39, 104) look charily at any operation for the relief of hypertension until the pathological basis for the condition is found, and still others (112) report the use of medical treatment alone, or in combination with surgery (153), with apparent success. The inadequacy of pre-operative and postoperative observations (95) and the desperate lack of criteria for the selection of cases is voiced by many earnest investigators (153). Some surgeons are experiencing uncertainty and distrust of most of the current theories of proper treatment (92, 140, 154, 168). Even definition and differentiation of "essential" and "malignant" hypertension have not been attained (160).

It is obvious, then, from the numerous and conflicting reports, that concerted action cannot be put into play and the optimal results from the

adoption, he points out that Pende's operation is used, with modifications in Italy by Pieri, Donati, Ciceri, Stropum, Mingazzini, Alessandri, Valdomi and Paolucci, in America by Peet, Adson, Craig, and others in France by Camolat, Langeron, Vincent, Desorcher, Fontaine, Leriche, and Jeanneney, and in Roumania by Janu. Ciceri does not agree with the criticism of Hermann (129, 161), he believes the operation is justified if sustained by clinical results, regardless of any animal experimentation. Leriche (168), however, is not entirely willing to accept splanchnicectomy; he believes the pathological basis of essential hypertension will be found in abnormal adrenal function and discredits the value of the application of Goldblatt dogs to human hypertension.

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surgical treatment of hypertension cannot be expected until clinicians accept a common definition for the types of hypertension conduct their clinical investigations in the same way they would conduct carefully controlled laboratory experiments, find suitable criteria for the selection of patients and perform their favorite operation only when it is on a sound physiological basis. It is true that the nature of hypertension presents one of the most difficult problems in all medical endeavor and the difficulties in its solution no doubt account for the multiplicity of ideas and therapeutic measures which have been reported. However a complete understanding of the pathogenesis and treatment of hypertension will come not through a greater volume of work done but through meticulously managed investigation both clinical and experimental.

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SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Fischer, E.: Symptoms of Pressure upon the Corpus Callosum Demonstrated by Arteriography (Das Symptom der Balkenpressung im Gefäßbild) 62 Tag d. deutsch. Ges. f. Chir., Berlin, 1938

Blood-vessel photography today has a definite place in the diagnosis of brain tumors. Except in cases of blood-vessel degeneration, arteriography is employed in place of ventriculography in all growths of the anterior, parietal, temporal lobes of the brain, and in growths in the region of the sella. Demonstration of the blood vessels is not only more definite but it is less harmful, and better diagnoses are obtained not only in relation to the site but also as to the nature of the growth. The method employed is that of Loehr, Olivecrona, and Toennis; pictures are made in two planes, and in contrast to Monitz considerable importance is given to the anterior view. And in contrast to Monitz and Loehr the injection is done on one side only, that of the tumor. This procedure in most cases is sufficient to demonstrate the lesion and is easier on the patient with marked cerebral edema. From the author's large number of vessel pictures he presents only a few characteristic cases and calls attention to the anterior view, and the relation of the anterior cerebral artery to the different tumors. The misplacement of the anterior cerebral artery by tumors in the immediate vicinity should be differentiated from that due to pressure exerted more distantly. The anterior view has been divided into distinct areas and on this basis 5 types of local disturbance of this artery are described: (1) the beginning of the horizontal section, by small parasellar tumors, (2) the lower rising portion, by basal tumors, (3) the middle upper rising portion, by frontal lobe processes, (4) the anterior epicallal portion, by paramedian and frontal tumors, and (5) the posterior epicallal portion, by paramedian tumors in the parietal region. A characteristic finding in this anterior view is the extension of the tumor with a local stretching out of the vessels over the median line to the healthy side.

The displacements of the artery in the anterior view are entirely different if the lesion is a distant one, especially if the seat of the tumor is in the parietal or temporal lobes. The portion of the anterior cerebral artery in the knee of the corpus callosum and the anterior portions of the pericallosal and callosomarginal arteries, with the more movable anterior portions of the corpus callosum and the neighboring cerebral convolutions under the free edge of the falx, are pressed to the sound side. These are cases in which also the ventricle shape as a result of the callosal pressure may give the "paradoxical impression" described by Winkelhauer. Characteristic for the action of distant tumor pressure in the

anterior arteriographic picture are (1) a wavy, frequently tuft-like course of the anterior rising portion of the anterior cerebral artery, and (2) a typical displacement of the anterior callosal portion of the anterior cerebral artery.

In the discussion MACKH stated that hemisphere tumors, which arise in the domain of the internal carotid artery, are always demonstrable with arteriography. Tumors which cannot be demonstrated are those of the posterior fossa and those which are medianly placed and supplied by the circle of Willis. Bilateral arteriography is not always necessary. The lateral and frontal views are of more importance. Mackh demonstrated several cases very clearly with arteriograms, which were not at all clear in the clinical picture. In conclusion, he presented the arteriogram of a patient who for a number of years was treated as a genuine epileptic and who according to the authorities ought to have been sterilized. In the arteriogram, however, the findings were those of a temporal-lobe tumor on the right side. The patient was cured by a radical operation.

The value of arteriography during the last few years has become so apparent that today it is considered a mistake to operate for a cerebral tumor without arteriography beforehand. Within the near future, arteriography will offer more in the diagnosis of cerebral tumors than all the other methods usually employed.

LEO A. JUHNKE, M.D.

Roettgen, P., Selbach, H., Stockert, F. G. von, and Toennis, W.: Studies and Observations on the Development of Transitory Postoperative Focal Symptoms and Changes in the Cerebrospinal Fluid (Untersuchungen und Beobachtungen ueber die Entstehung voruebergewandter postoperativer Herdsymptome und postoperativer Liquorveranderungen) Zentralbl. Neurochir., 1938, 3, 12.

Transitory focal symptoms after brain operations. Roettgen and Stockert reported aphasic disturbances which occurred suddenly on the third or fourth day after operation regardless of the site of the tumor or the parts of the brain involved. In right-handed individuals the symptoms arose in tumors of the left side, never in tumors on the right side. These were always motor aphasic disturbances in the sense of a Gerstmann syndrome (finger agnosia, with right-left disturbance, difficulty in arithmetic, and agraphia of the parietal type). In spite of severe aphasia and apraxia, there was no noteworthy paresis. There was never a sensory aphasia, only direct trauma was involved. These authors also reported psychic disturbances after operations in the hypothalamus region. Foerster and Gagel have pointed out that with stimulation of the anterior portion of the third ventricle some syndromes of trauma to the posterior portion appear helatedly. Amnesia may occur also, but it disappears after from two to five days. There-

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SURGERY OF THE THORAX

CHEST WALL AND BREAST

Funck-Brentano, P., Bertrand, I., and Poilleux, F.:
Phyllode Tumors of the Breast (Les tumeurs
phyllodes du sein) *J de chir*, 1938, 51 506

The "phyllode" tumors of the breast were described by Johann Mueller in 1828 as definitely benign cystosarcoma phyllodes. In 1931, Lee and Pack collected 333 cases of this type. Funck-Brentano and his associates at the Salpêtrière report that in the surgical clinic of this Hospital 5 cases of this type were observed from 1919 to 1936. In this same period there were 502 malignant epithelial tumors of the breast, 6 sarcomas, and 198 benign adenomas treated at this clinic.

The tumors may grow to a large size, but usually the patient comes to the surgeon when the growth is about the size of a fist. On section, the tumor is found to be lobulated, the general arrangement of the lobules and cystic cavities suggests a leaf, hence the name "phyllode." The cystic formations are not true cysts, as a rule, but areas of myxomatous degeneration or necrosis, parts of the tumor are solid. The tumor does not infiltrate the underlying muscle or aponeurosis, neither does it invade the skin. The axillary glands, which have been carefully examined in a number of cases, show no pathological changes. Histologically the tumor shows groups of epithelial cells representing glandular tissue in dense connective tissue.

More characteristic are the fissures lined with epithelium which divide the tumor into lobules. The phyllode tumor resembles an intracanalicular adenofibroma in many respects, but its lobules are much larger and in more regular arrangement. The stroma is characteristic in these tumors and is more abundant than in the adenofibroma, it shows in some areas a proliferation of fibroblasts, but with no neoplastic mitosis or other signs of malignancy. In other areas a sarcomatous appearance is noted, in these areas the lobules show degeneration, the characteristic phyllode appearance is lost, and neoplastic fibroblasts with large nuclei showing mitosis are present. Such sarcomatous degeneration is found only in certain limited areas, and does not seem to have the power of extending indefinitely. This is an unusual finding in tumor pathology, and such areas of sarcomatous changes are found in tumors of this type which are operated upon in an early as well as in a later stage of their development. In other areas the stroma shows a myxoid appearance, the cells have many ramifications, they anastomose with each other, and have a clear substance in the interstices. In still other areas the stroma may show an edematous infiltration. It is this myxoid and edematous stroma that gives to some lobules a cystic appearance. The epithelial elements of the tumor show less polymorphism than the stroma, and never any

indication of neoplastic change. Certain areas of the tumor undergo necrotic changes, which are often accompanied by edematous infiltration of the stroma. The authors propose the designation "fibroadenomyxoma phyllodes" for this tumor as it indicates its anatomical, chemical, and histological characteristics.

Clinically, these tumors develop very slowly and do not attract the patient's attention until they reach a considerable size. On examination, the tumor is irregular in form and nodular underneath the skin. The skin over it may appear entirely normal, or may appear as if stretched, and sometimes reddened, with the venous network more prominent than normal. In certain portions the tumor is soft, in others hard, on the whole it is more elastic and less indurated than a cancer. It is freely movable, because it is not adherent to either the muscular tissue at its base, or the skin above it. Unless the tumor has grown to a large size, the general condition of the patient is good. If operation is performed, even at an advanced stage, complete cure is usually obtained. There are neither glandular nor distant metastases. Occasionally there may be a local recurrence, but such recurrences are benign and operable. If the tumor is small, the preoperative diagnosis is usually adenofibroma, this diagnosis can be corrected by examination of sections of the tumor. If the tumor is large, a diagnosis of sarcoma is more apt to be made.

Treatment is operative, and it is desirable to examine gross sections of the tumor at the time of operation. If the tumor is small and the patient is a young woman, conservative operation (subcutaneous removal of the tumor) may be done. Even if the operation is followed by recurrence, the recurrence is also benign, and a more extensive operation may be done for removal of the breast. However, in the majority of cases the conservative operation is sufficient. With a large tumor, amputation of the breast is necessary, but a radical operation with removal of the axillary glands is not indicated.

ALICE M. MEYERS

Cohn, I.: Carcinoma of the Breast in the Negro.
Ann Surg, 1938, 107 716

This article is based on a study of negro patients who were admitted to the Charity Hospital, New Orleans, for treatment of carcinoma of the breast. The study was made with a view to determining the relative frequency of breast cancer in the white and negro races, the stage of its development at the time of admission to the hospital, the methods of treatment employed, and the results obtained.

In the period from 1932 to 1936 inclusive, 481 patients with carcinoma of the breast were admitted to the Charity Hospital. Of these, 256 were negroes and 225 were white. The percentage of colored

fore this is a typical midbrain syndrome. These phenomena are similar to the first temporary local inflammatory postoperative focal reactions. More extensive symptoms are induced by cerebral edema. The authors also often observed on the third or fourth day an organic disturbance of consciousness with psychomotor inhibitions and definite perseveration. However all of these postoperative disturbances are unpredictable. They do not occur in left handed individuals nor in children. Why these disturbances occur or do not occur is not known. The type of tumor is not a factor. The explanation lies in the tendency toward edema which is characteristic of brain tissue. Hypertonia may be a contributory factor as well as the state of nutrition (too much sodium chloride). At present preparation and after care are not the most important factors in the success of brain surgery. The operative technique is today so perfected that tumors of benign histological structure are no longer considered inoperable. Correct diagnosis is now possible in almost 100 per cent of the cases.

Psychic disturbances after brain operations. Stockert asks whether a brain operation is to be compared with brain trauma resulting from blunt injuries to the skull. This view may be substantiated by the development on the third day after operations in the vicinity of the hypothalamic centers of typical midbrain symptoms such as sleep in the day time and restlessness at night, delirium with disorientation as to time and place and disturbances of memory for the immediate past as in a Korsakoff syndrome. The cerebral commotion is characterized by unconsciousness and retrograde amnesia. As we know such is not the difficulty in cases operated upon under local anesthesia, neither does retrograde amnesia occur after brain operations. Exceptions occur when operation is done in the abdominal position or for the purpose of freeing the chiasma region and some spinal fluid is withdrawn so that the brain sinks markedly forward or backward and the patient becomes sleepy and helpless. These symptoms disappear as soon as the position of the brain is changed or when the spinal fluid is replaced by saline solution.

Upon stimulation of the intercerebral midbrain regions, the patients present a retrograde amnesia up to the third or fourth day after operation and from the moment that they begin to feel sleepy. Psychotic postoperative disturbances may also be induced by increased intracranial pressure, arachnoiditis and cerebral edema as typical postoperative biological changes. Most of the patients developed on the second or third day of this illness an organic disturbance of consciousness in the sense of a psychomotor inhibition and in finding words for expression. In a series of 400 patients with brain tumors which were studied histologically there were 7 cases of

temporary hallucination. Among these were 5 cases of cerebellar tumor in which occlusive hydrocephalus had existed for some time.

Postoperative cerebrospinal fluid changes. Seibach carried out studies on the cerebrospinal fluid of 460 patients who had undergone trepanation. 300 of these patients had brain tumors. At no time was there observed any regular correlation of the alkali reserve or albumin concentration in the fluid from various locations (ventricles, cisterns or lumbar regions). In brain tumors, whether supratentorial or infratentorial, no noteworthy diagnostic conclusion could be reached by examinations of the cerebrospinal fluid prior to operation. In operative examinations of the fluid in these patients indicated that in the first five or ten days there was a correlation between the high albumin and the low alkali reserve values which values equalized themselves in that period of time. These values were related more to the metabolic changes in the field of operation than to the general metabolism. Analogous changes in the alkali reserve and albumin concentration of the blood have been reported by Toennis in reaction of the knee joint. There was an increase in the acid radicles as a result of the physicochemical changes induced by the operation particularly in the cerebral tissues. A spinal fluid is evolved which is not isotonic; there is an increased amount of cerebrospinal fluid and an increase in the volume of the brain. (FRANZ) JACOB E. KATZ, M.D.

Evans H. S. and Courville C. B. Calcification and Ossification in Tuberculoma of the Brain. Review of the Literature and Report of 3 Cases. *Arch. Surg.* 1934, 39, 637.

In this article the authors describe 3 cases of calcification and ossification in tuberculoma of the brain. Reports on this subject are extremely rare and it is apparent that calcification in a tuberculoma occurs very infrequently in only about 7 per cent of the tuberculomas of the brain. All 3 cases occurred in young Mexican children in 2 of them the early signs were those of tuberculous meningitis and in the third they were signs of a progressive hemiplegia simulating tumor. In every case a very careful necropsy was performed and the specimens from the brain were given an especially careful histological examination. The authors discuss ideas on the deposit of calcium in tuberculomas and on the process of calcification. They pointed out that the formation of bone in tuberculomas occurs but that it is much less frequent than the laying down of calcium.

The bibliography is comprehensive. Altogether 15 cases of this deposition of calcium in tuberculomas have been reported to which the authors have added the very instructive study of their 3 cases.

ADRIEN VERBET, CHEN, M.D.

that complete "sterilization" of the operative field is not obtained by this method

In some cases in which it has been impossible to remove the tumor or the regional lymphatics completely, supplementary radiotherapy may be employed, the treatment should be intensive enough to destroy the remaining cancer cells if possible. A dosage of from 3,000 to 4,000 roentgens should be used for each field, with a 1 to 2 mm. copper filter and a 200-kv current. This dosage may be given in twenty or twenty-five days, except in the cases of glandular epitheliomas or less radiosensitive tumors, in which irradiation should be given in daily treatments or twice-daily treatments for from thirty to thirty-five days

In cases in which radical operation has been done, B  cl  re and others advocate prophylactic post-operative radiation. For this purpose divided doses are given over a period of several weeks to make a total of from 1,500 to 2,000 roentgens, and treatment may be repeated with a smaller dosage three and six months later. Regaud, on the other hand, does not approve of such postoperative treatment, claiming that the cells that escape the surgeon's knife are not radiosensitive, and that they are still further "immunized" to radiation by the treatment given. At the Lyon Center, from 1922 to 1928, 141 patients with cancer of the breast were operated upon by the typical Halsted technique without postoperative irradiation, 48 per cent lived more than three years, and from 25 to 30 per cent, more than five years. In 50 cases, the operation was followed by radiation according to B  cl  re's method of small divided doses. Of this group 39 per cent survived three years and from 15 to 20 per cent, five years. These figures do not appear to be favorable to prophylactic post-operative radiation. Moreover, all of the patients who were given postoperative radiation had cancer in an advanced stage with considerable involvement of the axillary glands, while a number of the patients treated by operation alone had a cancer in the early stage. If these patients are excluded from this group, the percentage of three-year survivals is 41 per cent, or practically the same as that of patients given postoperative radiation. No evidence was found that postoperative radiation favors the occurrence of metastases, the percentage of bone metastases in the two groups, as shown by roentgenological examination, was essentially the same.

Radiotherapy for recurrences is indicated in the following cases

1. When the recurrence is in the form of multiple cutaneous and subcutaneous nodules in the thorax

2. When there is involvement of the cutaneous or the parasternal or deep lymphatics. Such recurrences usually advance rapidly and treatment is rarely successful

3. When the recurrence is in the axillary glands. In these cases treatment is often effective, especially if cross-fire technique is used.

4. When the supraclavicular glands are involved. Radium applied externally with radium molds is

often superior to roentgen therapy. The prognosis is poor with any form of treatment

In some cases of breast cancer, radiation alone is employed. This is usually done in those cases in which the patient refuses operation, or in which operation is contra-indicated on account of the general condition. Regaud has good results with superficial breast cancers in small breasts from radium applied externally. At the Lyon Center, 23 patients with cancer of the breast have been treated with radiation alone. The dosage employed in some of these cases was relatively small, and no conclusions can be drawn from the results obtained in so small a series of cases. As a general rule, the authors believe that operable cancers of the breast should be treated primarily by the surgeon.

Alice M. Meyers.

Adair, F. E., Frazell, E. L., and Quimby, E. H. : A Study of Tissue Dosage and Radiation Effect in Cases of Operable Cancer of the Breast Treated by a Combination of Pre-Operative Irradiation and Radical Mastectomy. *Radiology*, 1938, 30: 588

During the years from 1933 to 1937, pre-operative irradiation has been employed routinely in operable cases of breast cancer at the Memorial Hospital, New York, and data obtained from 201 of these cases are presented to show the correlation between the amount of radiation delivered to the tumor and the radiation effect resulting. Before treatment was initiated, careful measurements had been made relating to the exact size of the tumor, also to its thickness, depth, and position in the breast. One hundred and thirty-eight of the patients were treated with the 200-kv roentgen rays and 63 were treated with the 4-gm radium element pack. Variable amounts of irradiation were given at intervals and, after approximately from eight to ten weeks following completion of the pre-operative irradiation, a radical mastectomy was performed. The tissues were then subjected to meticulous pathological study. Differing radiation effects were grouped according to a scale of microscopic changes.

The findings upon which various group effects were based, the technique used, and the means by which dosages were calculated are described in detail. Numerous tables are included to show the relative effects of radium and roentgen rays, the comparison between radiation effects and clinical regression, the relation between the tumor dose and the radiation effect, the relation between the skin dose and the tumor dose, the relation between the size of the tumor and the radiation effect, and the relation between threshold doses and the size of the tumor. All of these topics are discussed at some length.

In both series of cases—those treated by roentgen rays and those treated by the radium pack—the following facts were apparent:

1. The clinical impression as to the residual tumor can be fairly well relied on to express the radiation

patients with breast cancer to the total number of patients for the period under study remained constant 10-17 per cent. More nulliparous negro women than nulliparous white women presented themselves for treatment of breast cancer. The age of the negro patient averages about four and seven tenths years younger than that of the white patient. The greatest incidence of breast cancer in the colored person is shown to be in the decade between the ages of forty and fifty years, while its greatest incidence in the white person is between the ages of fifty and sixty years. Sixty per cent of the patients had metastases in the axillary lymph nodes when they were admitted to the hospital and of 224 patients whose records were adequate for use in this study only 118 were considered suitable for radical operation. In 27 of the patients operation could not be considered. These facts are an indication of the late stage of the condition in which this group of patients presented themselves for treatment.

The percentage of known deaths following radical operation is given as 46. If to this is added the cases of patients who could not be followed up, the deaths occurring within from one to five years after operation may be well above 65 per cent. Only 74 per cent of the colored patients received any form of pre-operative roentgenological investigation. Therefore the percentage of skeletal metastases in this series cannot be accurately estimated.

JACOB M. MORRIS, M.D.

Taylor G. W. and Meltzer A. Inflammatory Carcinoma of the Breast. *Am. J. Cancer* 1935 33: 33.

The authors present a clinical study of 38 cases of inflammatory carcinoma of the breast seen over a period of nine and one half years.

This grave disease is not rare; the literature contains more than 100 cases. The incidence was 4 per cent of all breast cancers in our series. Although the disease is rare after seventy, its age distribution is the same as for cancer of the breast in general.

The inflammation may be of a primary type, i.e., it may arise simultaneously with the cancer, or it may be of the secondary type, i.e., it may occur after a scirrhous cancer has been present for some time. Pain is a common early symptom in the primary type. The inflammatory signs may result in mistakes in the diagnosis and in judicious early therapy.

The primary type comes to medical attention early, yet the inflammatory signs are usually full blown and the disease is widespread on admission. The cancer may have an acute erysipeloid distribution or show a tendency toward nodular localization. Ulceration is rare.

The disease spreads rapidly in the superficial lymphatic structures of the chest wall. Multiple visceral metastases occur early, but the rapid course of the disease often does not permit them to attain clinical recognition. Bone metastases were recognized roentgenologically in only 4 primary cases.

In the uncomplicated cases leucocytosis, fever, and other signs of toxicity are rare. The patients maintain remarkably good health throughout the greater part of the course of the disease and cachexia is unusual. Death is due most often to intrathoracic complications. The average duration of life in primary cases was twenty-one and three tenths months and in secondary cases ten and eight tenths months after appearance of the inflammatory signs.

The inflammatory signs of edema, redness, and heat are due to extensive lymphatic blockage by the cancer and congestion of the subpapillary plexus. There is no uniform pathological type.

The large fatty breast, as well as the hyperplastic breast of late pregnancy or lactation, seem to be predisposing factors of inflammatory carcinoma. No other predisposing factors could be established.

The results of therapy are poor. Surgery is followed by prompt evidence of supraclavicular disease, skin recurrence, or invasion of the opposite breast. X-ray treatment seems to give the best palliative results. The artificial menopause does not alter the course of the disease. JOSEPH K. NARAY, M.D.

Bérard L. and Ponthus P. The Place of Radiotherapy in the Treatment of Cancer of the Breast. (*La position actuelle de la radiothérapie dans le traitement du cancer du sein*). *Lyon et* 1935 35: 129.

Bérard and Ponthus note that it is difficult to evaluate the efficacy of various methods of treatment in cancer of the breast. Breast cancers are of different histological types and vary in their clinical development. Statistics of the results of surgical and radiological treatment include all these types and do not as a rule clearly differentiate them. The evolution of these tumors is prolonged, while five years freedom from recurrence is generally considered to be a criterion of cure. This period is really too short, as recurrences may develop in the lymphatic region of the primary tumor after a much longer period of time.

In considering the clinical use of radiotherapy the authors note that a number of surgeons advocate pre-operative radiotherapy for large tumors with numerous adhesions or for sterilization of the neighboring lymphatics and to prevent the dissemination of cancer cells. At the Center for the Prevention and Treatment of Cancer at Lyon, 13 patients with inoperable cancer of the breast were treated by radiation. In all of them the tumor was rendered operable. Two of these patients were living in 1935, seven and nine years respectively after operation; the others had died an average of two years after treatment. The dosage used was from 1,500 to 1,800 roentgens per field with a copper filter from 0.5 to 1 mm. in thickness and a current of 200 kv. The authors believe that pre-operative radiotherapy in such cases of large and adherent tumors is of value, but they do not consider pre-operative treatment of tumors that are primarily operable to be necessary, as they agree with Regaud.

resorption of the pleural edema. During the process of the localization of the effusion, puncture is indicated for drainage and for the injection of antiseptics, the authors have employed collargol or electrargol. In some cases in which the collection of pus is difficult to reach, puncture should be done under fluoroscopic control by the surgeon. Injections of collargol especially have given favorable results in the authors' experience, they have prevented secondary infection, relieved symptoms, and hastened the evolution of the abscess. The authors have found, however, that acute purulent axillary pleurisy due to streptococci cannot be cured by this procedure alone. Surgical drainage by means of rib resection and pleurotomy is necessary. The site of operation should be planned so that the lowest point of the abscess is drained without opening of the large pleural cavity. The best site for the operation is usually the median axillary line, the level varying with the location and extent of the lesion, as shown by roentgenograms and puncture. In 2 of the authors' cases reported, the fourth rib was resected, in 1 case, the seventh rib, in 4 cases, the eighth rib, and in 2 cases, the ninth rib. This operation should be done when the axillary abscess has fully "matured," but before a thick capsule has formed, the optimum time is the fourth week after the onset of the acute pulmonary disease. If fever recurs after a few days of normal temperature, or if the amount of pus increases constantly in spite of puncture and drainage, operation is indicated. This operation gives good results in acute cases, the wound heals well, and if postoperative breathing exercises are carried out regularly with the spirometer, the lung expands normally. In chronic cases, however, as in the first case reported, a second operation is necessary after rib resection and pleurotomy, to completely obliterate the cavity and ensure normal expansion of the lung. This consists in a thoracotomy with rib resection beyond the limits of the original lesion, but the resection of the pleura should not exceed these limits, decortication of the lung is usually necessary. The results of operation in chronic cases are not as favorable as those in acute cases, a considerable degree of invalidism is the sequel.

ALICE M. MEYERS

Carter, B. N. The Use of Muscle Flaps in the Closure of Chronic Empyema Cavities. *Surgery*, 1938, 3 506

In view of the fact that the literature to date bears comparatively few references to the use of muscle flaps in the closure of chronic empyema cavities, the article presented by Carter assumes great significance. The two main objectives of it are first, to emphasize the fact that adequate drainage by the resection of long segments of several ribs and wide exteriorization of the empyema cavity is the most important step in the treatment of chronic empyema, and second, to call attention to the advantage of pedicled muscle flaps in the closure of the chronic empyema cavity that remains after adequate drain-

age has accomplished all it can. The many illustrations which accompany the article show the steps in the various operative procedures and serve admirably to explain the text as well as to illustrate several useful technical points concerning various muscles which can be used as "fills."

At the outset the author stresses the fact that many chronic empyema cavities will obliterate themselves completely or in part if really adequate drainage is provided. This is true particularly in cases of chronic empyema which are of relatively short duration. Some types of chronic empyema, however, do not yield such satisfactory results, even with ideal drainage conditions. In this category three types of chronic empyema are outstanding, namely, (1) secondarily infected tuberculous empyema, (2) non-tuberculous empyema of several years' standing, and (3) chronic empyema complicated by bronchial fistulas. The first of these groups presents a particularly difficult problem, not only on account of the extensive fibrosis of the lung and pleura which prevents lung expansion, but also on account of the possibility of its lighting up the quiescent tuberculosis by expanding the lung. What nature, then, cannot accomplish by way of lung expansion the surgeon must try to supplement in the task of obliteration of the cavity. This he does by means of plastic operations on the thoracic wall. In cases of long-standing non-tuberculous empyema, greatly thickened visceral and parietal pleura and fibrosed lung tissue also prevent adequate expansion of the lung. Bronchial fistulas are serious complications since they interfere with lung expansion, reinfect the wound, and preclude active irrigation of the cavity.

It becomes quite evident, then, that many cases of chronic empyema will reach a stage during their treatment when a cavity which cannot, without further surgical treatment, decrease in size is still present. It is with these stubborn cases of empyema cavities that the author's article deals. Two underlying principles are all-important in the surgical treatment of these cases, namely, adequate drainage and wide exteriorization of the empyema cavity. The resection of short segments of one or two ribs and the introduction of a large rubber tube do not constitute adequate drainage. To accomplish his objective the author recommends that the chest wall be widely opened by the resection of at least 4 in., preferably 6 in., of two or three ribs situated at the lowermost portion of the empyema cavity. The thickened parietal pleura thus exposed is excised to the limits of the incision laterally and to the remaining ribs above and below. An opening from 4 to 6 in. long and from 3 to 4 in. wide is thus made into the dependent portion of the cavity. Through such an opening the interior of the cavity can be inspected, foreign bodies, if present, can be removed, bronchial fistulas discovered, and pockets found. Thereupon thorough irrigation with Dakin's solution or azochloramide can be carried out. Also light packs saturated with these solutions can be placed in contact with the walls of the entire cavity. No drainage

effect obtained (in 71 per cent of the cases treated with the x rays and in 73 per cent of those treated with the radium pack)

2 The larger the minimum tissue dose delivered to the tumor the more likely is a profound radiation effect to be obtained

3 It is necessary to deliver with the x rays at least six threshold skin doses within three weeks and with radium almost three threshold skin doses within six days to the deepest portion of the tumor if the maximum radiation effects are to be obtained in 70 per cent and 56 per cent respectively

4 There is a definite relationship between the size of the tumor mass and the radiation effect obtained

5 The chance of obtaining a high radiation effect decreases as the size of the tumor increases

6 Since tumors as well as the amounts of overlying tissue vary enormously in size it is evident that from the same beam of irradiation very different doses may be delivered to the most deep lying tumor cells. The inadequacy of expressing radiation dosage as a certain number of roentgens, or of milli gram hours per port is evident

7 The age of the patient and the differences between the intervals following the completion of irradiation and before operation had no apparent influence on the radiation effect observed in the tumor in this series of cases

ADOLPH HARTZEL, M.D.

TRACHEA LUNGS AND PLEURA

Freedman L. M. The Etiology of Lung Abscess
et England J U 1933 213 663

Although a clinical diagnosis of lung abscess was made in 445 patients at the Boston City Hospital from 1926 to 1933 Freedman selects only 276 (60.2 per cent) of these for this analysis and comparative study

In this series 196 cases of lung abscess were attributed to medical conditions 4 cases followed trauma and 76 cases occurred as a complication to surgery. Although tonsillectomy was a frequent cause of lung abscess in these patients it was less frequent than most authors report and was less frequent than not only pneumonia but also other postoperative condition. Lung abscess following tonsillectomy is found more frequently in adult (1 626) than in children (1 8852). It is interesting to note that in the 8 768 tonsillectomies performed on adults at the Boston City Hospital during these years all but 85 of the patients were given a general anesthetic and 14 of them developed lung abscess whereas there was no abscess in the small group in whom local anesthesia was used

In general it was noted that the location of the abscesses both of medical and postoperative origin showed a ratio of approximately 2:1 favoring the right lung

Other statistics of interest in this study are as follows:

The Incidence of Lung Abscess

Condition	Total cases	Lung abscess	Ratio
Medical			
Pneumonia	15 727	104	1 146
Surgical			
Tonsils and Adenoids	26 473	16	1 1654
Teeth	3 264	10	1 320
Appendix	12 702	9	1 1411
Stomach	486	9	1 54
Gall Bladder	2 123	0	1 233
Uterus and Tubes	10 830	14	1 774

HOWARD B. CARROLL, M.D.

Clavelin and Sarroste Non Tuberculous Axillary Pleurisy (Les pleurésies purulentes axillaires non tuberculeuses) *Rev de chir* Par 1938 57 83

Clavelin and Sarroste report 9 cases of non tuberculous axillary pleurisy. The first case was of the chronic type the patient had had an attack of pneumonia almost two years before his admission to the hospital. After apparent recovery he began to cough frequently showed a febrile temperature and lost weight. It was supposed that he was tuberculous until x ray examination showed no tuberculous lesions but a homogeneous rounded opacity in the left axillary region. Puncture yielded pus which was sterile. In the 8 other cases the pleurisy was acute all the patients had acute lobar or bronchial pneumonia from the eighth to the tenth day of the disease signs of pleural effusion developed while the pulmonary symptoms began to subside. Roentgenograms and puncture established the diagnosis of axillary pleurisy. In 1 case the effusion was at first serofibrinous but soon became purulent though cultures were negative. In 5 cases the effusion was purulent from the first and hemolytic streptococci were isolated from the pus. In 3 of these cases the lesion was localized in the axillary region at the time of the first x ray examination. In the 2 other cases the first roentgenogram showed diffuse pleurisy on the involved side but gradually this became localized in the axillary region. In the last 2 cases there was an encysted pleurisy with several collections of pus one being located in the axilla.

It is probable that in all these cases there was at first a diffuse inflammation of the pleura with ultimate localization of the effusion in the axillary region but roentgenograms were not made sufficiently early in all of the cases to demonstrate this. When the effusion first became localized in these acute cases the patient's general condition showed some improvement and the temperature fell but not to normal after a few days the temperature rose again and the signs and symptoms of pleural involvement became more marked. The localization of the pleural effusion in the axilla is probably to be attributed to the fact that the pulmonary lesion was more extensive in this region than elsewhere and after a phase of diffuse inflammation of the pleura the effusion tended to localize around it.

During the phase of diffuse inflammation the treatment is medical with the aim of aiding the

resorption of the pleural edema. During the process of the localization of the effusion, puncture is indicated for drainage and for the injection of antiseptics, the authors have employed collargol or electrargol. In some cases in which the collection of pus is difficult to reach, puncture should be done under fluoroscopic control by the surgeon. Injections of collargol especially have given favorable results in the authors' experience, they have prevented secondary infection, relieved symptoms, and hastened the evolution of the abscess. The authors have found, however, that acute purulent axillary pleurisy due to streptococci cannot be cured by this procedure alone. Surgical drainage by means of rib resection and pleurotomy is necessary. The site of operation should be planned so that the lowest point of the abscess is drained without opening of the large pleural cavity. The best site for the operation is usually the median axillary line, the level varying with the location and extent of the lesion, as shown by roentgenograms and puncture. In 2 of the authors' cases reported, the fourth rib was resected; in 1 case, the seventh rib, in 4 cases, the eighth rib, and in 2 cases, the ninth rib. This operation should be done when the axillary abscess has fully "matured," but before a thick capsule has formed, the optimum time is the fourth week after the onset of the acute pulmonary disease. If fever recurs after a few days of normal temperature, or if the amount of pus increases constantly in spite of puncture and drainage, operation is indicated. This operation gives good results in acute cases, the wound heals well, and if postoperative breathing exercises are carried out regularly with the spirometer, the lung expands normally. In chronic cases, however, as in the first case reported, a second operation is necessary after rib resection and pleurotomy, to completely obliterate the cavity and ensure normal expansion of the lung. This consists in a thoracotomy with rib resection beyond the limits of the original lesion, but the resection of the pleura should not exceed these limits, decortication of the lung is usually necessary. The results of operation in chronic cases are not as favorable as those in acute cases, a considerable degree of invalidism is the sequel.

ALICE M. MEYERS

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ADOLPH HARTMAN M D

TRACHEA LUNGS, AND PLEURA

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New England J M 1938 117 603

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In this series 196 cases of lung abscess were attributed to medical conditions 4 cases followed trauma and 76 cases occurred as a complication to surgery. Although tonsillectomy was a frequent cause of lung abscess in these patients it was less frequent than most authors report, and was less frequent than not only pneumonia but also other postoperative conditions. Lung abscess following tonsillectomy is found more frequently in adults (1/216) than in children (1/342). It is interesting to note that in the 876 tonsillectomies performed on adults at the Boston City Hospital during these years all but 85 of the patients were given a general anesthetic and 14 of them developed lung abscess whereas there was no abscess in the small group in whom local anesthesia was used.

In general it was noted that the location of the abscesses both of medical and postoperative origin showed a ratio of approximately 2:1 favoring the right lung.

Other statistics of interest in this study are as follows:

The Incidence of Lung Abscess

Condition	Total cases	Lung abscess	Ratio
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Pneumonia	15 177	104	1:146
Surgical			
Tonsils and Adenoids	26 473	16	1:1654
Teeth	3 204	10	1:310
Appendix	12 02	9	1:1311
Stomach	466	9	1:54
Uterus and Tubes	2 128	9	1:243
	10 830	14	1:774

HONARD B. CLARK M.D.

Clavella and Sarroste Non Tuberculous Axillary Pleurisy (Les pleurésies purulentes axillaires ou tuberculeuses) *Rev de chir 1er 1938 57 83*

Clavella and Sarroste report 9 cases of non tuberculous axillary pleurisy. The first case was of the chronic type the patient had had an attack of pneumonia almost 20 years before his admission to the hospital. After apparent recovery he began to cough frequently showed a febrile temperature and lost weight. It was supposed that he was tuberculous until x ray examination showed no tuberculous lesions but a homogeneous rounded opacity in the left axillary region. Puncture yielded pus which was sterile. In the 8 other cases the pleurisy was acute all the patients had acute lobar or bronchopneumonia from the eighth to the tenth day of the disease signs of pleural effusion developed while the pulmonary symptoms began to subside. Roentgenograms and puncture established the diagnosis of axillary pleurisy. In 1 case the effusion was at first serofibrinous but soon became purulent though cultures were negative. In 5 cases the effusion was purulent from the first and hemolytic streptococci were isolated from the pus. In 3 of these cases the lesion was localized in the axillary region at the time of the first x ray examination. In the 2 other cases the first roentgenogram showed diffuse pleurisy on the involved side but gradually this became localized in the axillary region. In the last 2 cases there was an encysted pleurisy with several collections of pus one being located in the axilla.

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During the phase of diffuse inflammation the treatment is medical with the aim of aiding the

THE RÔLE OF GASTROSCOPY IN THE RECOGNITION AND IDENTIFICATION OF GASTRIC LESIONS

Collective Review

RUDOLF SCHINDLER, M.D., Chicago, Illinois

UNTIL 1932 diagnostic gastroscopy was correctly considered to be dangerous and therefore was carried out by only a few research workers (Schindler, Korbsch, Gutzeit, Moutier, Henning, Hohlweg). However, since 1922, these few men have developed the knowledge of the endoscopic pathology of the stomach. When in 1932 the safe flexible gastroscope was invented and brought on the market (76), the soil was well prepared and proved to be fertile. Rodgers (69) describes in an amusing manner the sudden gastroscopic invasion of England. Gastroscopy—having been for reasons of manufacturing a purely German matter for decades—conquered the Anglo-Saxon countries at the same time, namely in the fall of 1934. In 1936 and 1937 the method was generally accepted. Resistance was almost nil. In the following abstract the gastroscopic literature of 1937 will be reviewed, some books and papers of the preceding years cannot be omitted entirely.

The expression of the sudden importance of the new diagnostic method was the appearance of four textbooks. Henning's (36) small book has been translated very well by Rodgers (69). It briefly demonstrates the usefulness and possibilities of gastroscopy to those who do not desire to carry out examinations actively themselves. The textbooks of Moutier (58) in French, of Gutzeit and Teitge (35) in German, and of Schindler (82) in English cover the entire field. They describe the development and technique of gastroscopy in detail, they discuss the aspect of the normal and diseased stomach, they compare the endoscopic findings with the clinical pictures and with the results of other examination methods, especially with the x-ray examination, and they emphasize the many new conceptions of gastric disease which have been developed according to gastroscopic observations. The three books are illustrated by numerous colored pictures and form together a gastroscopic atlas.

After the appearance of these books three editorials appearing in the most representative medical journals of the English-speaking world described gastroscopy as an "established" method.

The editorial in the *Lancet*, 1937, p. 1200, contained the following sentence: "It is . . . reasonable to urge that every large hospital should possess a gastroscope and an experienced gastroscopist. The latter is not made in a month or two . . ." The editorial of the *Medical Journal of Australia*, 1937, 24: 267, equally emphasized the value of the new method. The *Journal of the American Medical Association*, 1937, 110: 373, published a thorough review on the significance of gastroscopy closing with the sentence: "Again science and medicine have benefited by the developments that have featured the coming of the machine age."

Papers on gastroscopy can be subdivided into three great groups. Many still have to be considered as introductory papers, they discuss the special technique, the indications, contra-indications, and findings. In the second group extensive gastroscopic observations are published. The third group reports clinical observations and research studies in which gastroscopy has been used as an indispensable procedure not needing any discussion or explanation. The most important group of these papers was read before the Second International Congress for Gastro-Enterology, Paris, November, 1937 (27). The main subject was "The Early Diagnosis of Gastric Carcinoma," and there was almost unanimity among the speakers that gastroscopy would play an outstanding rôle in the fight against the most common cancer.

Though not belonging to the time we are reviewing, Benedict's (5) excellent introductory paper must be mentioned since this author was the first to introduce gastroscopy in the United States. It was fortunate for the method that the first man to transplant it here was not only a good technician but also a careful and critical physician. His clinical papers will be mentioned later. The first man to recommend gastroscopy in England was Edwards (28).

The most thorough of all summarizing papers was that of Schloss (90). It would replace a small textbook and, since it is readily accessible, it can be recommended strongly to those surgeons and

tubes are needed since by sewing of the skin edges to the edges of the pleura the cavity is exteriorized and the opening into it cannot close.

After this process of exteriorizing the cavity there should follow treatment with Dakin's solution or azochloramide. This is to continue until the cavity has been obliterated by the gradual expansion of the lung or until it has ceased to decrease in size. If complete expansion occurs the skin edges can be readily freed and closed. If, however, a residual cavity remains a more extensive plastic operation becomes necessary.

The further surgical procedure to obliterate the residual cavity is dependent upon the type, the size, and the location of the cavity. A chronic empyema cavity with relatively thin parietal pleura can be closed or greatly decreased in size by extrapleural thoracoplasty done in many stages and with for malization of the rib beds. If however the parietal pleura is very thick a simple thoracoplasty will not accomplish much in decreasing the size of the cavity. Even though the ribs be resected from spine to sternum the rigid pleura continues to hold the cavity open. The small cavity in the lower thorax can be obliterated simply by the resection of the ribs and the thick pleura overlying it while the soft tissues are allowed to fall into and fill the cavity. However the large cavities in the lower portion of the thorax, those cavities lying beneath the scapula and also those at the apex of the thoracic cage cannot be so easily closed. The scapula will not fall completely in contact with the underlying lung after the ribs beneath it have been resected, and unless a fill of some sort is placed beneath the scapula a dead space will persist which may give rise to a recurrence of the empyema. Likewise the configuration of the thorax at the apex is such that cavities situated there will not be filled by the falling in of the soft tissues when the ribs overlying the cavity have been removed. It is in these instances that muscle flaps can be swung into the empyema cavity in order to obliterate it. The following muscles are available for this purpose: the latissimus dorsi, the trapezius, the sacrospinalis and the pectorals. Before the muscle flap is swung into a cavity situated in the lower thorax the ribs should have been removed beyond the limits of the cavity and the parietal pleura

excised to the margins of the cavity. In the case of some of the cavities that extend to the apex or under the scapula not all the ribs over the cavity need be removed. It is sufficient to fill the resulting recess beneath one or two ribs with the muscle flaps.

It goes without saying that the cavity should be sterile or nearly so before the muscle is placed in it. In the case of extensive cavities the unroofing by means of resection of the ribs and thickened parietal pleura must be done in several stages. In order to get enough material to fill the cavity it is important to plan the operation so as to utilize every bit of muscle possible. A very useful method of obtaining added bulk of muscle is to make a second incision at right angles to the one which has been placed at the lowermost border of the empyema cavity to reflect the skin flaps thus formed and to cut the muscle which is to be utilized at a considerably lower level. Several inches of muscle may be gained in this way. The intercostal muscles should be carefully preserved when possible and likewise utilized as a fill. They are especially useful to plug bronchial fistulas. If the cavity is not too deep they may be preserved intact and allowed to fall into the floor of the cavity. The author also advocates stripping the thickened pleura from the underside of the intercostal muscle and excising it rather than using it together with the muscle for the pleura may be riddled with small sinuses leading to minute abscess cavities and if preserved these may reinfect the cavity or the wound. Conditions such as these may well be the cause for the recurrent chronic empyema. More over in tuberculous empyema which constitutes from 10 to 23 per cent of chronic empyemas the parietal pleura practically always is the site of to berules or tuberculous granulation tissue.

Unless the empyema cavity is very large relatively little deformity is present after the operation. The author has found the use of pedicled muscle flaps to be very satisfactory in dealing with the persistent chronic empyema cavity in the closure of extrapleural cavities resulting from the excision of cold abscess of the chest wall in the cure of chronic lung abscess and in the secondary closure of infected thoracoplasty wounds in which an extrapleural cavity remains beneath the scapula.

MATTHEW J. SEXTON, M.D.

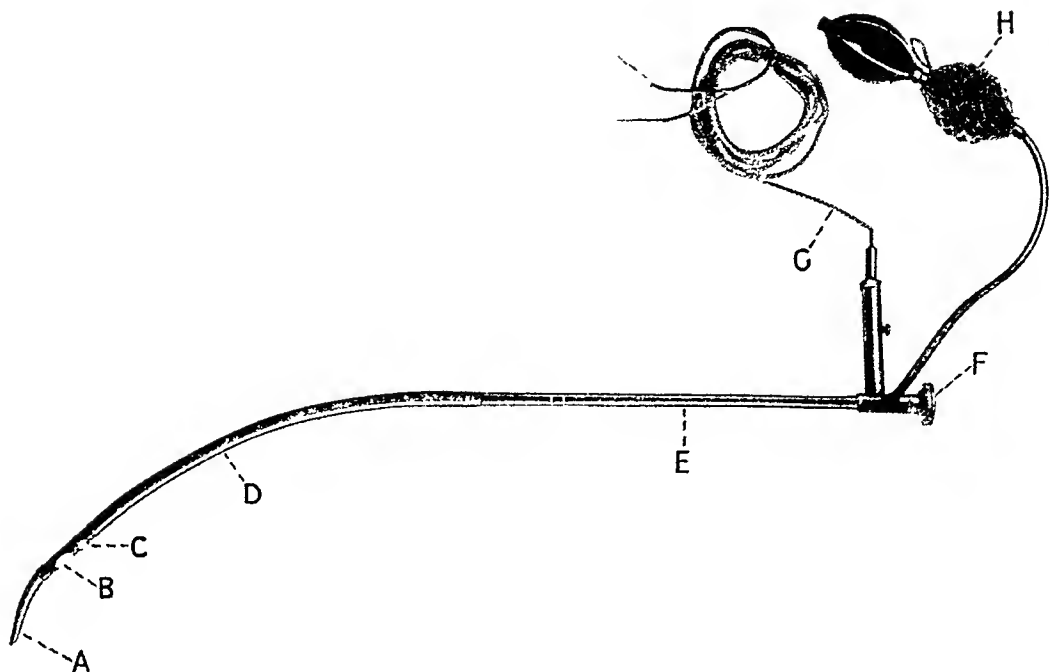


Fig 1 Wolf-Schindler flexible gastroscope, A, rubber finger, B, electric lamp, C, objective D flexible part, E

rigid part, F ocular, G, electric cable, and H, air balloon

bulged out so much that it sometimes becomes an obstacle to the introduction. The last model, showing a wide flat glass window, is very satisfactory. The objective window is the "highest" point of the gastroscope, i.e. the objective window lies about 1 mm above the level of the gastrosopic circumference. This fact is important. In gastroscopy with the rigid gastroscope one of the greatest difficulties was to get the objective into the stomach in an unsoiled condition. The old Elsner gastroscope of 1911 was impractical because the objective usually became dirty. It was found, then, that it was possible to clean the objective by wiping it off at the protruding posterior wall of the stomach. In order to facilitate this procedure the objective of the flexible gastroscope was built as an elevated area, and then it was found out that this elevation usually came into the stomach clean because it was wiped off at the cardia—an astonishing progress over the older systems. The prism of the objective deviates the rays coming from the gastric wall into the axis of the gastroscope. Here two different angles must be distinguished, which usually are confused by the beginner. The objective collects a cone-shaped bundle of rays, and the middle ray

is broken into the optical axis of the instrument in an angle which corresponds with the optical data of the special instrument. Although Henning recommends "retrograde" and "prograde" optical systems, they have been discontinued now. That instrument in which the middle ray is broken by 90° has become the standard instrument. The outer rays of the bundle which is permitted to enter the instrument include another angle, the "visual angle." Two different "visual angles" are used at the present time. The "wide angled" instrument has a visual angle of 85° . It is still considered to be the standard instrument, but probably it will be replaced by the newer 50° instrument which has a smaller visual angle but a better magnification than the 85° instrument. The latter will remain useful in post-operative stomachs.

The objective is followed by the lower flexible portion of the gastroscope, the upper end of which is still several centimeters above the cardia even if the instrument is introduced to its full length with the ocular piece touching the teeth. The flexible portion is made of a very hard steel tube cut in a long spiral which is at the same time very flexible and very elastic, i.e., having the

internists who would inform themselves superficially about gastroscopic questions. The papers of C and C L Jackson (39) and Schindler (77, 78) which appeared in 1935 and 1936 will be mentioned. In the beginning Jackson thought that peroral esophagoscopy should precede flexible tube gastroscopy. It seems, however, that now he has abandoned this standpoint which would have jeopardized the development of gastroscopy decisively. Also, Freeman (29, 30) who at first combined the safe gastroscopic procedure with the dangerous esophagoscopy, now has separated the two methods distinctly. Excellent introductions were given also by Borland (12, 13) Horan (38) Geier (34) and Carey (14). Ortmayr (65) published a list of indications for gastroscopy later to be rendered in detail. Other introductory papers were written by Moersch (55) Rossi (72), Jutras (42), Thorlakson (97) Kerkhoff (48) Rose (71) and Barnett (3, 4).

In all these publications there is almost unanimity concerning the special technique. The following discussion is based on the books and papers mentioned.

THE HISTORY OF GASTROSCOPY

The history of gastroscopy started in 1863 when Kussmaul first introduced open long rigid tubes into the stomach of a swordswallower. The second period of the development of gastroscopy began in 1881 when Mikulicz recognized that gastroscopy had to follow the optical principles of cystoscopy because the stomach is a large cavity at the end of a relatively thin long tube. He built a rigid angulated gastroscope bearing an electric lamp at its tip; the objective collected the rays coming from the gastric wall and deviated them into the axis of the instrument; the picture obtained was inspected through the ocular. The optical data of this type of instrument improved rapidly. The instruments of Locning Stueda (1909) and Eisner (1911) gave beautiful sharp upright correct sided pictures. However with rigid instruments often only a very small portion of the stomach could be seen. Moreover all these instruments were dangerous. Even when the contra indications were carefully observed fatal ruptures of the esophagus were possible. Therefore gastroscopy remained an experimental method in the hands of a few selected workers. Some gastroscopists (Kuttner, Kelling, Sussmann 1911) tried to overcome the difficulties by constructing tubes which were introduced into the stomach when flexible and which were straightened after introduction. This straightening proved to be still more dangerous than the

introduction of entirely rigid instruments. These tubes were quickly discarded. This type of flexible instrument should not be confused with the flexible gastroscope of today; the latter does not require straightening but remains flexible during the examination. The third period of gastroscopy began in 1922. Gastroscopy with rigid instruments was taken up as a daily method of examination (75); the numerous endoscopic pictures were described carefully and were compared with the clinical symptoms. All gastroscopists checked their findings by operations and autopsies and compared them with the results of x-ray examination (Schindler, Gutzeit, Rahnenfuhrer, Hohlaue, Moutier, Korbach, Henning and many others). This was the spring tide, every day brought new discoveries and conceptions which only now begin to penetrate into the consciousness of the medical world. Especially the discovery of the frequency and importance of the entity chronic gastritis was to have great practical consequences. The last and probably final period started with the invention of the safe flexible gastroscope in 1932 (66). The immediate result was that gastroscopy spread over the world. Gastroscopies now are carried out in the medical centers of Mexico, Argentina and Australia, and even in Manchukuo and in Italian Somaliland.

THE INSTRUMENT

The Wolf Schindler flexible gastroscope is the generally used standard instrument (Fig. 1).

The tip of this instrument consists of a very elastic rubber finger which is most essential for the full utilization of the flexibility of the instrument. The finger bends as soon as it touches the gastric wall and thereby bends the flexible portion of the gastroscope in the esophagus. Henning replaced this finger at first by a round rubber sponge; later by an elastic rubber ball. Neither leads the instrument; the former being especially objectionable because it causes dangerous friction (see below under dangers). Only the finger tip should be used. Some experienced gastroscopists notably Moutier (58) contend that the introduction of the finger is more difficult than that of the ball. This however is a matter of habit and the safer tip should not be given up for a dangerous one because of the technique of the gastroscopist.

The finger is attached on the small electric bulb. The lamp with the rubber finger may be screwed off and replaced if necessary. This however happens but rarely. The modern electric lamps have an almost eternal life. Different models exist. In one of them the glass of the lamp is

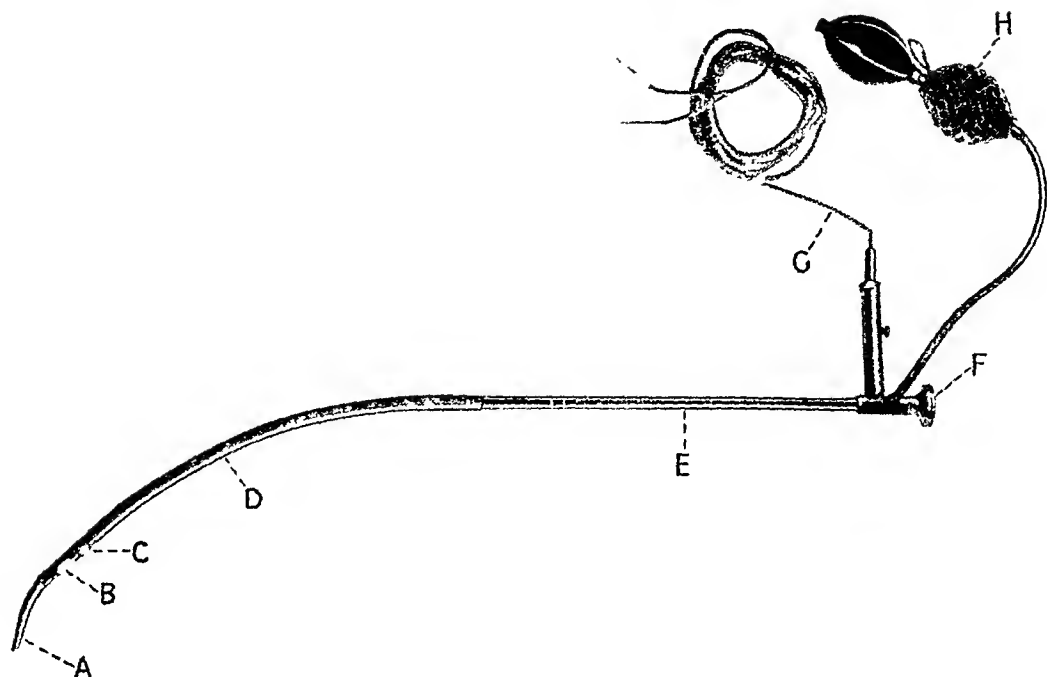


Fig 1 Wolf-Schindler flexible gastroscope, A, rubber finger, B, electric lamp, C, objective D flexible part, E

rigid part, F ocular, G, electric cable, and H, air balloon

bulged out so much that it sometimes becomes an obstacle to the introduction. The last model, showing a wide flat glass window, is very satisfactory. The objective window is the "highest" point of the gastroscope, i.e. the objective window lies about 1 mm above the level of the gastrosopic circumference. This fact is important. In gastroscopy with the rigid gastroscope one of the greatest difficulties was to get the objective into the stomach in an unsoiled condition. The old Elsner gastroscope of 1911 was impractical because the objective usually became dirty. It was found, then, that it was possible to clean the objective by wiping it off at the protruding posterior wall of the stomach. In order to facilitate this procedure the objective of the flexible gastroscope was built as an elevated area, and then it was found out that this elevation usually came into the stomach clean because it was wiped off at the cardia—an astonishing progress over the older systems. The prism of the objective deviates the rays coming from the gastric wall into the axis of the gastroscope. Here two different angles must be distinguished, which usually are confused by the beginner. The objective collects a cone-shaped bundle of rays, and the middle ray

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tendency to regain its former shape and position. It contains numerous systems of thick convex lenses. The picture formed by the objective lenses is given from one focal point to the next one a bending of the tube to an angle of 34° in several different planes being permissible. The spiral metal tube is covered by two rubber hoses which prevent dust from entering the optical system and between which air, necessary for the distention of the stomach, can pass. The flexible portion is fastened to the upper rigid portion which bears the ocular piece. The diameter of the rigid part is only 8.5 mm. The air balloon and the electric cable are attached to the ocular piece. The result of this complicated optical system is an upright right-sided entirely sharp picture which is obtained when the bending of the instrument does not transgress 34° almost all portions of the stomach are usually visible except three blind spots namely a portion of the lesser curvature of the antrum, a portion of the lower pole of the stomach and that strip of the posterior wall on which the instrument is lying.

Recent attempts to improve the standard instrument have considered these blind spots. Rodgers (70) device probably will have great importance. It originally consisted of a special rubber sheath carrying an inflatable rubber balloon situated just proximal to the window of the objective and connected by a capillary rubber tube to a bulb at the upper end of the instrument. When the balloon was inflated by squeezing the bulb it lifted the gastric mucosa out of contact with the objective and enabled it to be inspected satisfactorily. This original model did not work because the rubber was too soft. However the idea was good. Therefore Wolf built a similar balloon which is connected with a very short piece of rubber tube in order to avoid an increase in the diameter of the instrument. The balloon is connected with the bulb by a capillary rubber tube and gets the necessary volume when the bulb is compressed entirely. This usually makes possible good visualization of the posterior wall, cardia and even the esophageal mucosa. Some patients contend that the loose capillary rubber tube irritates the throat, moreover the introduction of the instrument with this device attached is more difficult than without it. Nevertheless this offers the possibility of visualizing ulcers of the posterior wall and of the lesser curvature in which the differential diagnosis between benign ulcer and carcinoma should be made. For this reason Rodgers' device is a definite progress.

A Japanese factory (Taket in Tokyo) has tried to imitate the Wolf Schindler gastroscope but

it seems that with the exception of Kanham and his co-workers (49) nobody has used it as yet so that it is impossible to tell whether or not its accessories (rubber, metal spiral lens system) are of the same good quality as those of the original. This instrument, however, has some modifications which should be mentioned. A metal wire permits a slight active bending of the lower portion of the flexible part. The intention of this construction is to improve the visualization of the pylorus by bending the tip toward the pyloric region. It is impossible to tell whether this goal has been attained. Complicated mechanical devices are apt to increase the fragility of the instrument. The pylorus can be found with the German standard instrument at least as often as indicated in the Japanese statistics—by the experienced examiner even more frequently. Only comparative examinations with both instruments could show whether a definite advantage is obtained and if so whether it is not overpaid by an increased fragility. The second construction a photographic camera will be mentioned in a later paragraph on gastrophotography.

Gutzeit and Teige (35) in their excellent book still recommend the rigid gastroscope by Korbach. They contend that the optical data of rigid instruments necessarily are superior to those of flexible instruments and that no accidents have occurred with rigid instruments in the hands of Gutzeit. The first reason is not of great importance after the afore mentioned construction of the new 30° flexible instrument. So far as the second reason is concerned thousands of examinations may be carried out without any accident by skillful and careful examiners (the reviewer himself had no accidents from 1923 to 1932). With the rigid gastroscope however a mishap may occur virtually at any moment. Because of this hidden danger the flexible gastroscope had been constructed. When the newest Korbach instrument came into use fatal mishaps were immediately observed (see below under 'dangers'). Thorlakson reported such accidents (97). With the strongest possible emphasis therefore gastroscopists should be warned not to use any type of rigid instrument for diagnostic purposes.

THE TECHNIQUE OF GASTROSCOPY

A standard technique has been developed which, with slight modifications apparently is used everywhere.

Diagnostic gastroscopy does not require hospitalization except in cases of pyloric obstruction in which a thorough lavage is necessary on the evening before the examination. The patient

has to be without breakfast. Some gastroscopists still give morphine before the examination, others refuse to use it, contending the patient should be able to relax voluntarily and, therefore, should not be drowsy. Usually small amounts of codeine and atropine are given to reduce the reflexes. A thorough anesthesia of the throat is obtained by the use of a 2-per-cent pontocaine solution to which adrenalin is added. It is administered everywhere by the Schindler hypopharynx tube. The stomach then is emptied through an Ewald tube, in a modified Trendelenburg position. These preparations take about twelve or fifteen minutes, the following gastroscopy about three or five minutes. In two hours usually six examinations are carried out.

The left-side position is generally accepted. All other positions have been proved to be less satisfactory. The patient should be entirely relaxed, his head hanging down and supported by the left hand of the assistant. Some examiners, especially Benedict (5), work without an assistant. This requires exceptional skill. Anyhow, no assistant is better than a bad one. There is general agreement that the personality and skill of the first assistant are of fundamental importance. A continuous change in nurses should not be permitted. The first assistant can be replaced as little as the head nurse of an operating room. Some examiners work with special tables, especially Henning (36) and his pupils, but it seems that the results obtained with less expensive tables are equally satisfactory. There are differences in the introduction of the gastroscope. One school introduces the flexible gastroscope in the same position in which rigid gastroscopes were introduced, i.e., from the beginning on in the axis of the body of the patient, the head being extended. The other school prefers to utilize fully the flexible quality of the instrument and to start the introduction with the instrument lying perpendicular to the long body axis, only when the rigid portion approaches the teeth the gastroscope is swept over the quarter of a circle and brought into the body axis. In this position the patient is less apprehensive than with extended head, the rubber covering the instrument does not touch the teeth, therefore the friction is almost nil. Other differences are noted in the position of the left hand of the operator. While some have this hand in pronation pulling the tongue forward with one or two fingers, others contend that in this way it is possible to enter the trachea and, therefore, the left hand should be in supination, so that the operator looks in his palm. The left index finger then gently pushes the rubber tip of the gastro-

scope toward the posterior wall of the pharynx and prevents it from slipping down in the left pyriform sinus. The last but most important difference concerns the speed of introduction. Some observers, especially esophagoscopists, go ahead very slowly. Others, especially Schindler (82), lay strongest emphasis on the necessity of a speedy, though careful, introduction. They think the instrument should reach the lowest depth of the stomach within three seconds, then there will be no time for the formation of spastic contractions. If this is true, it is not astonishing that Kiriara (49) had great difficulties in finding the pylorus because he recommends very slow and gradual introduction of the instrument. After the introduction, air is inflated into the stomach, the electric current is switched on, and the inspection begins. There is unanimity that introduction of the instrument is easy, but that orientation and interpretation are very difficult. Long experience is needed to enable the examiner to form correct conclusions. Therefore, the statistics which are published by beginners and which are based only on some hundred cases are only of very doubtful value.

INDICATIONS

The indications as listed by Ortmayer (65) give the best idea of the usefulness of gastroscopy. These indications quoted here extensively are not based on theory but gathered from observation of nearly 500 cases.

"1. Any patient with an obscure abdominal complaint, who has had a negative physical, laboratory, and x-ray study should be gastroscopied. A gastric lesion too small or too shallow to be seen with x-rays may be present.

"2. Anyone with digestive symptoms, "dyspepsia," who has been called neurotic, should be gastroscopied before being sent to the psychotherapist. Such a patient may have atrophic gastritis, or even early carcinoma.

"3. Likewise, a patient with unexplained loss of weight, loss of appetite or nausea, may have an early gastric lesion and should be gastroscopied.

"4. Unexplained hematemesis or melena constitute definite indication for gastroscopy. Very small shallow actively bleeding gastric erosions may be found or large mucosal hemorrhages. These latter may arouse the first suspicion of abdominal purpura.

"5. A patient who had a positive x-ray, i.e., one in whom gastric or duodenal pathology has been found, should be gastroscopied for a number of reasons:

"a. to confirm a difficult diagnosis

b to confirm a doubtful diagnosis

"c to aid in the differential diagnosis between malignant and benign gastric ulcer. Definite differences in the gastroscopic appearance of the floors of these ulcers may be found

"d If a positive clinical diagnosis of gastric carcinoma has been made, to aid in determining its resectability, when no metastases have been found in the tissue elsewhere. Carcinoma with sharply defined edges localized in a favorable region in the stomach, should be resectable

e After a clinical diagnosis of duodenal ulcer is made in order to determine whether the patient has additional gastric pathology. The duodenal lesion of course cannot be seen through the gastroscope but a duodenal and gastric ulcer have been known to occur in the same patient and the latter found only by gastroscopy or a gastritis may accompany duodenal ulcer as it frequently does. Severe gastritis will certainly influence the prognosis and duration of therapy for the ulcer

f Patients in whom pyloric obstruction is found—the gastroscopist can also aid in determining the cause of the obstruction whether cancer or ulcer and thereby facilitate the sometimes difficult choice between gastrectomy and gastroenterostomy, so important in patients weakened by vomiting and undernutrition

6 Any patient in whom gastritis has been diagnosed or clinically suspected should be gastroscopied. Gastroscopy is the only exact way of making this diagnosis. Very exceptionally x rays can correctly demonstrate chronic hypertrophic gastritis in its severest forms not otherwise. Clinicians were handicapped for years in the diagnosis of chronic gastritis for lack of proofs of its existence in the living patient until the gastroscopists demonstrated its frequent occurrence

7 Any patient for whom exploratory laparotomy is contemplated should be gastroscopied. The exploratory in contemplation always disappointing to the patient and in retrospect frequently so to the surgeon may thereby be transformed into a therapeutic operation or be avoided altogether

"8 Gastrectomized patients should be gastroscopied at regular intervals after operation in order to determine as early as possible whether there is a recurrence of the original lesion

9 After gastroenterostomy at regular intervals

"10 Patients with blood dyscrasias should be gastroscopied. Pernicious anemia is accompanied by all grades of atrophic gastritis and has shown to yield to liver therapy

"11 Patients with known atrophic gastritis should be gastroscopied at regular intervals. It is thought by some to be the forerunner of gastric carcinoma. (This indication seems especially important if one takes into consideration the result of the discussion on gastric carcinoma at the Second International Congress for Gastro-Enterology, Paris, November, 1927. Rev.)

"12 Patients in whom the rarer lesions of the stomach may be present should be gastroscopied. Too little is known before post mortem, of gastric tuberculosis, syphilis, lymphoblastoma and other granulomas

"13 Lastly, there is the very important indication of the gastroscopic follow up during therapy of gastric carcinoma, gastric ulcer, and chronic gastritis"

CONTRA INDICATIONS

These have been listed satisfactorily by Barnett (3) who writes that the contra indications may be divided into two classes

1. Real contra indications

- a Esophageal varices
- b Obstruction of the esophagus (and of the cardia—Pey.) either intrinsic or extrinsic
- c Aortic aneurysm
- d Corrosive gastritis
- e Esophageal diverticula (This in the experience of the reviewer, is no absolute contra indication)

2. Relative contra indications

- a Angina pectoris
- b Dyspnea
- c Psychosis
- d Severe curvature of the spine
- e Cardiospasm

It should be mentioned that the most important real contra indication, obstruction of the esophagus or of the cardia should not be excluded by the x rays (which sometimes fail to show the obstruction) but by the introduction of a thick Ewald tube

DISCOMFORT CAUSED BY GASTROSCOPY

There is almost unanimity that gastroscopy carried out with the flexible gastroscope causes only very little discomfort in co-operative patients. It certainly is much less than that caused by cystoscopy in the male. All gastroscopists have been able to examine their patients repeatedly. The highest number of examinations carried out in one man—65—has been reported by Schindler (8a). From 15 to 25 examinations are frequent. It is well known that patients who have had a diagnostic esophagoscopy almost never consent to a repetition and it is difficult to per-

suade such patients to undergo gastroscopy. If, however, they do undergo gastroscopy, they then insist that esophagoscopy and gastroscopy should not be compared. In stiff and spastic patients soreness of the throat lasting from one to four days is sometimes observed. The discomfort depends upon milieu and origin. Borland (12) found that it is often difficult to perform gastroscopy on colored people. Schindler (82) had difficulties with the first generation of European immigrants, but stated, however, that the second generation were as co-operative as Americans usually are. Psychoneurotics often are the best patients. An exceptional statistical study has been published by Kirihara (49). During the examination he found excitement in 4 per cent, dyspnea in 3.8 per cent, pallor and cyanosis in 3.3 per cent, sweating in 20 per cent, and nausea and vomiting in 20.1 per cent (1) of all cases. These symptoms are not observed either in the United States or in Germany. Some Japanese patients form an exceptionally sensitive group.

DANGERS

After the invention of the flexible gastroscope it was believed that every kind of danger had been discarded, provided strict attention was given to the few contra-indications, and that this instrument would be a safe one in the hands of even an awkward examiner. It is, indeed, of utmost importance that diagnostic instruments be constructed in such a way that they are safe not only in the hands of the highly skilled and trained technician, but in the hands of every physician who wants to use them. This was not so with regard to the former rigid gastroscopes and the open tube esophagoscopes. Therefore, it should be emphasized that no lesion of the hypopharynx nor of the esophagus has been observed by means of the flexible Wolf-Schindler gastroscope. When Henning modified an important part of this instrument by replacing the elastic long rubber tip with a round rubber sponge, perforations of the stomach were observed immediately. Five such lesions have been reported, which occurred in a very short period of time. Fortunately all of the patients recovered. After the Henning sponge had been discarded, this type of injury was never observed again in ten thousands of examinations. Schindler and Renshaw (87) showed experimentally that two factors had been responsible: (1) the sponge caused an excessive friction on the surface of the stomach, and (2) the sponge tip had not the quality of the finger tip of leading and bending the flexible part over the posterior gastric wall,

the finger tip alone being able to distribute the pressure of the instrument over a broad area. After the re-introduction of the finger tip, flexible tube gastroscopy became an entirely safe procedure.

It would be scarcely worthwhile to report this development in detail at this time, except that the danger of mishaps might be increased by Gutzeit's continued recommendation of Korbsch's rigid gastroscope. In very skilled hands this thin rigid instrument is probably safe, but virtually it is as dangerous as any other rigid instrument. With the former rigid instruments mishaps were very rare (Gutzeit himself never had an accident, a fact probably responsible for his attitude), but the virtual possibility of mishaps did not permit gastroscopy to become an "established method." Mishaps with Korbsch's instrument are not only theoretically possible, they have been observed practically. There are only very few such instruments used in the United States and in Canada, but, nevertheless, already 3 mishaps, 2 of them fatal ruptures of the esophagus, have been observed (Thorlakson, 97). Gastroscopy as an indispensable daily method of examination will be again discredited if the Korbsch instruments are not abandoned.

A few words should be said concerning the dangers resulting from the use of pontocaine for anesthetization of the pharynx. Pontocaine seems to be the best substitute for cocaine for the anesthetization of mucosal surfaces. The reviewer regularly used 10 c cm of the 2 per cent solution together with 10 drops of the usual 1:1000 solution of adrenalin or suprarenin, he never observed the slightest symptom of intoxication. However, he has been told by Carey (16) that a death occurred under the fully developed symptoms of cocaine poisoning. It seems that 2 similar cases have been observed in Germany and in Italy, respectively. Although this mishap evidently is a kind of curiosity, the careful examiner will prefer to protect his patient and himself by keeping at hand an antidote (1 ampoule of pentothol sodium with distilled water, or evipan). This should be injected intravenously when the slightest signs of cocaine poisoning are observed.

THE VALUE OF GASTROSCOPY AS COMPARED WITH LABORATORY METHODS

Almost all authors, Henning, Moutier, and Gutzeit (36, 58, 35), agree that gastroscopy should be the last examination to be used on patients suffering from abdominal distress. They contend that the usual methods (gastric analysis and examination of the stool for occult blood) should be car-

ried out first, gastroscopy complementing the picture thereby obtained. It seems that Schindler (82) alone refuses to compromise and definitely disagrees with this opinion. He contends that the laboratory methods have failed almost completely to help in the diagnosis, prognosis, and therapy, of gastric diseases. He admits that histamine negative anacidity points to the absence of ulcer, and the presence of free hydrochloric acid to the absence of pernicious anemia, but with these two statements the realm of laboratory methods is already exhausted. The making of a functional diagnosis does not help to make a prognosis or to institute intelligent therapy. Histamine-proved anacidity may be found in entirely healthy people, in psychoneurotics and psychotic individuals in whom the stomach itself should not be treated, in individuals with superficial atrophic, and hypertrophic gastritis, although the prognosis in these three conditions would be a very different one, and in individuals with gastric syphilis, benign tumors, and, especially, carcinoma. He believes that the examination of the stool for occult blood is of little value for early diagnoses. He thinks that Moynihan's famous statement on the superiority of the anamnesis over the laboratory tests was correct at that time but that now we know that for an early diagnosis the most careful case history usually is insufficient. Only the combination of the two anatomical methods, roentgenography and gastroscopy, is reliable. Only by these methods an early accurate diagnosis and differential diagnosis becomes possible.

The relation of roentgenography to gastroscopy will be discussed later.

CLINICAL PAPERS

Some of the published papers are not satisfactory because their content is based on too little experience. It seems that one needs the experience of from 100 to 400 gastroscopies before one is able to get everything out of the method especially to regularly visualize the antral region and to properly interpret the pictures seen. Therefore the statistical data given by Kurihara (49) are not entirely convincing. Taylor's paper (95) suffering from the same handicap is, nevertheless, an important one. The author in discussing the history of gastroscopy has omitted its most important part in an almost inexcusable manner but the clinical part comparing 66 gastroscopic observations with subsequent gastric operations is so instructive that its abstract will be included later. Royer, Bur, and Montejano (73) have introduced gastroscopy in Argentina. Their paper is based on 342 examinations. In 5 per cent an

observation of the stomach was impossible. They were not able to find the antrum in 37.8 per cent. They group the diffuse diseases of the gastric mucosa as follows:

- a Erosions and ulcerations
- b Submucosal hemorrhages (purpuras)
- c Atrophic lesions
- d Hypertrophic lesions
- e Other forms of gastritis

The authors have compared their findings carefully with clinical observations and have given extensive interesting tables. Their experiences in 6 cases of resected stomach correspond with those of other authors. Only once they found a normal mucosa in 5 instances a severe gastritis was observed. That they do not exaggerate the pathological findings is proved by the fact that they found a normal mucosa in not less than 25 instances among 51 cases of 'hyposthenic and hypersthenic dyspepsia'. Of great importance are the gastroscopic observations made in appendicitis and cholecystitis. In 5 of 6 cases of appendicitis the gastric mucosa was found to be normal, but in 1 case an erosive gastritis was seen. (This strange coincidence of acute appendicitis with erosive gastritis has been observed by the reviewer also. Further checks seem to be indispensable.) Unusually extensive material of cholecystitis has been examined by the authors. Their 50 patients in this group surpass the number examined gastroscopically even by Henning and Gutzeit. They found gastritis or other mucosal changes in 21 cases. Of the same importance is their observation that gastritis was combined with colitis in 3 of 9 cases. It is to be expected that the authors will publish this interesting material more extensively.

Ayala Gonzales (2) has introduced gastroscopy in Mexico. Three colored plates containing 39 pictures—though not very satisfactorily reproduced—show the abundance of material on which the author's paper is based.

ULCER

There is unanimity that gastroscopic examination is less useful in ulcer than in the other two major diseases of the stomach, gastritis and carcinoma. The duodenal ulcer and the ulcer of the pyloric channel can be found only by x-ray relief technique. The prepyloric ulcer only rarely can be seen through the gastroscope. The true gastric ulcer gives a striking picture (Fig. 2). Its healing process and its coming and going may readily be observed with the gastroscope. The gastric ulcers of the blind spot of the posterior wall usually will be overlooked although Rodger's sheath (69, 6)

may aid in their diagnosis. Some ulcers are found gastroscopically which cannot be demonstrated with the finest x-ray relief study. The diffuse changes of the gastric mucosa in ulcer-bearing stomachs are well seen. For this reason gastroscopy becomes a necessity for the surgical therapy of gastric and duodenal ulcers. Schindler (81) describes the value of gastroscopy in gastroduodenal ulcer in the following statements:

"1. Gastroscopy reveals gastric ulcers not demonstrable with other methods

"2. The success of medical treatment, complete epithelization, can be determined only by gastroscopy.

"3. Gastroscopy usually permits the differentiation between benign and malignant ulcer of the lesser curvature

"4. Early diagnosis of very small carcinomatous ulcers and their successful surgical treatment would more often become possible if each patient, over thirty-five years of age and in whom a crater of the lesser curvature had been found roentgenologically, would be gastroscopied

"5. The extent of inflammation accompanying gastroduodenal ulcer can be determined only gastroscopically. It may be of decisive influence upon the indication for operation. Probably the surgeon would not operate on an inflamed area because he would be afraid of the gastritis that might develop later in the postoperative stomach

"6. The source of gross hemorrhage may be determined gastroscopically. The respective findings either facilitate surgery or prevent it"

Some points need amplification. With regard to Statement 2, usually, but not always, the disappearance of the roentgenological niche coincides with the epithelization of the ulcer as observed gastroscopically. Uhlenbruck and Norpoth (99) used gastroscopy to check the final epithelization of gastric ulcers after treatment with larostidine. They were critical enough to admit that such an observation does not prove the effectiveness of the drug. This certainly is correct since the same effect may be obtained from the most varied methods of treatment.

With regard to Statements 3 and 4, the possibility of differentiating between benign and malignant ulcers by means of gastroscopic observations is one of the most important and amazing advantages of gastroscopy. Skeptics don't believe these statements. They think what cannot be seen macroscopically in the gross specimen cannot possibly be seen with the gastroscope. They forget that in gastroscopy the blood is still circulating, a fact which makes the edge and often the floor, also, of the malignant ulcer differ distinctly

from those of the benign ulcer. The skeptics argue further—microscopically we often find nests of cells in the deeper layers of the ulcer wall of the apparently benign ulcer which prove that it is not benign but turning malignant. With this argument they again forget the clinical facts. Histologists believe that from 20 to 50 per cent of all apparently benign ulcers are malignant (Staemmler, 92 and Bertrand, 10) in this histological sense. The clinician who uses the gastroscope, however, obtains another picture. If he decides that the ulcer, according to the gastroscopic picture, is a beginning carcinoma, then the course will show that he was right (83), and when he contends that the ulcer is benign, then the course will be that of a benign ulcer. The clinician who is well experienced in gastroscopy will probably see no benign ulcer turn into a malignant one. (The gastroscopic beginner and the clinician relying solely on the x-rays will make mistakes.) If this is true—apparently all gastroscopists have had similar experiences—if 100 gastroscopically benign ulcers can be observed over a period of from two to ten years without 1 of them turning into a malignancy, then evidently less than 1 per cent of all benign ulcers turn into malignancies. In this event gastroscopic diagnosis must necessarily be superior even to microscopic studies, or to put it better, the microscopic criteria of benignity and malignancy of an ulcer have not yet been established correctly and the histologist must learn from the endoscopist what he should consider as benign and what as malignant.

As to Statement 5, the importance of accompanying inflammation for the prognosis of gastric surgery in ulcer is usually not sufficiently appreciated. Also, endoscopic and histological concepts do not agree (79) and have to be accommodated to each other. Sometimes no inflammation at all is present, often inflammatory swelling around the ulcer is found, rarely all portions of the stomach are inflamed. Isolated antrum gastritis may be found in cases of chronic organic or spastic obstruction of the pylorus. Ulcerative antrum gastritis is not found in true gastroduodenal ulcer. R. Chevallier (21) describes and illustrates 2 cases of gastric ulcer with an operative check. In one of them a severe hypertrophic gastritis around the ulcer was observed, but in the other no inflammation was seen. Histological examination, in the last instance, confirmed the endoscopic finding.

With regard to Statement 6, gross hemorrhage coming from an unknown source is one of the most important indications for gastroscopy (Benedict, 9). It may come from an overlooked ulcer, from beginning carcinoma, from benign tumors, espe-

cially myomas (Fig 3), as well as from non surgical diseases, such as syphilis, hemorrhagic non inflammatory erosions and ulcerations of the different types of gastritis in these cases of gastritis a fatal outcome has been described repeatedly (Fig 4) In a case of duodenal ulcer with bleeding gastroscopy revealed that not the ulcer itself but a very small gastric hemorrhagic erosion was bleeding profusely Therefore, gastroscopy is indicated even if the source of bleeding seems to be known Gastroscopy has been feasible as soon as the third day after a profuse hemorrhage and probably would be innocuous even if performed during the hemorrhage

GASTRITIS

There is general agreement as to the statement that discovery of the frequency and importance of chronic non specific gastritis has been the most valuable contribution of gastroscopic research to general medicine Chronic non specific uncomplicated gastritis is found in from 40 to 50 per cent of all patients examined with the gastroscop. However there is a remarkable lack of papers eliciting new clinical knowledge from the gastroscopic findings One notes the bewilderment of most workers about the fact that there is apparently no relation between the outspoken endoscopic findings and the chameleon like changing clinical data (Garther and Borland 32) A good survey was made by Stix (33) Research on the cause of this frequent disease had been in vain as yet In Gutzeit and Teuge's textbook one will find a good compilation of all possible factors and diseases leading to or accompanied by chronic gastritis Some authors refuse each classification of the many various pictures seen gastroscopically, especially Gutzeit Others (Moutier 38) give a very detailed classification based chiefly on the description of the changes seen gastroscopically However, Schindler's very first classification into three great groups still is widely accepted (Edwards, Benedict, and many others) This classification tries to subdivide the findings according to the course and prognosis The three varieties are (1) superficial (2) atrophic and (3) hypertrophic chronic gastritis Schindler and Grunmayer (34) admit that there is a relation between the superficial and the atrophic form superficial gastritis may heal or may turn into atrophy Whether atrophy can occur without preceding superficial gastritis is not yet certain Hypertrophic gastritis is considered to be a different entity not tending to heal Attempts have been made to correlate the endoscopic picture of gastritis with a definite clinical picture (Moutier 38 and Svalem,

Jackson and Morrison, 94) but the results obtained are neither convincing nor encouraging (86) Luehr (54) described the gastroscopic picture seen in gastritis erosiva a chemical entity described first by Katsch (47) Luehr stated that there was no relation between the gastroscopic and the laboratory findings There is agreement with regard to the statement that in some cases of infiltrative hypertrophic gastritis the gastroscopic differential diagnosis may be impossible These are the rare cases of proliferative antrum gastritis leading sometimes to pyloric obstruction and therefore requiring surgical interference In these cases (0.2 per cent of all cases) the gastroscopist cannot tell the surgeon whether he will find a gastritis or an infiltrative carcinoma (Fig 5) The roentgenologist also makes a diagnosis of either carcinoma or chronic gastritis

A rational therapy of chronic gastritis is not known although many suggestions have been given Schindler (80) observed a case of severe hypertrophic ulcerative gastritis by repeated gastroscopic examinations over a period of ten years and then tried high voltage x ray therapy with a very good result One year later however, severe gastric atrophy developed

René Chevallier (23) has studied a disease he does not classify under chronic inflammation He observed tremendous localized edema of the gastric mucosa in allergic individuals the chief characteristic of which was its inconstancy Often he found accompanying mucosal hemorrhages At x ray examination a cancer was sometimes simulated and only gastroscopy permitted the diagnosis He called this disease gastric allergy to indicate that it was not inflammatory Schindler has repeatedly pointed out that not all diffuse lesions of the gastric mucosa can be considered inflammatory He mentioned especially the mucosal hemorrhages pigment spots and hemorrhagic erosions found so often in ulcer bearing stomachs or together with generalized purpura Paul Chevallier and Moutier called this picture 'gastric purpura' The same authors describe rare disturbances of the circulation consisting of the sudden appearance and disappearance of pale and red patches in the gastric mucosa during examination (19) René Chevallier (25) found that ulcer is by no means the most frequent source of gastric hemorrhage since many other bleeding lesions may be found such as those caused by inflammations allergy, and purpura

CARCINOMA

The most extensive gastroscopic literature is that on gastric carcinoma This is because of the fact



Fig 2

Fig 2 Gastroscopic view of a benign gastric ulcer of the lesser curvature above the "angulus." At the right side the dark cavity of the antrum is seen. A dark brown pigment-spot lies in the mucosa of the "musculus sphincter antri." The ulcer occupies the middle of the picture. A portion of its edge is undermined.

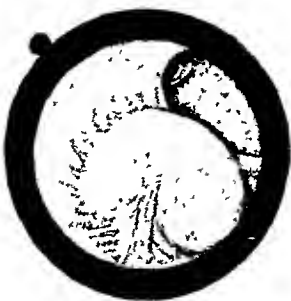


Fig 3

Fig 3 Gastroscopic view of a typical myoma of the anterior edge of the angulus, in a case of gross gastric hemorrhage. X-ray showed an indefinite filling defect.



Fig 4

Fig 4 Gastroscopic view of three inflammatory erosions in a case of "unexplained" gross gastric hemorrhage.

that the main subject of the Second International Congress for Gastro-Enterology at Paris, November, 1937, was "The Early Diagnosis of Gastric Carcinoma."

Already before this event some important papers on this subject were published. Benedict (7) compared gastroscopic findings with x-ray findings and with biopsy results in 14 cases. In 2 cases the gastroscopic diagnosis of a benign tumor was made and confirmed by autopsy, while the x-rays suggested malignancy. In 1 of the cases a small polypoid growth was suspected upon roentgen examination, while gastroscopy correctly suggested the presence of an infiltrative carcinoma. In 1 case the roentgenologist turned to gastroscopy in order to exclude syphilis, but an infiltrative carcinoma was found. In 1 case the diagnosis of hypertrophic gastritis was made after roentgen examination, but gastroscopy revealed malignancy three months before the radiological diagnosis became possible. In one case x-ray examination and gastroscopy both suggested the presence of an extragastric lesion and in another the extent of a gastric carcinoma. In the other cases the extent of the carcinoma was best determined by gastroscopy. Moutier (59) described gastroscopic pictures which looked like those found in carcinoma. These lesions, however, disappeared after antiluetic treatment and, therefore, had to be considered as being gastric syphilis. This author found that gastric cancers sometimes respond for a short time to antiluetic treatment. Catalanotti (17) discussed the gastroscopic forms of cancer and emphasized the difficulty of interpretation. Taylor's paper (95) has been illustrated by wonderful colored pictures. Twice he observed a benign tumor and thus avoided operation. In 2

cases he found a benign ulcer although carcinoma was suspected clinically. In some cases he believed a carcinoma to be operable, although the operation showed that this was not the case.

This observation leads to an important discussion: if one would try to state the operability of a carcinoma by describing that a strip of mucosa between the cardia and tumor is free of tumor, he would often be wrong. In infiltrative forms the tumor invades large portions of the gastric wall, which invasion cannot be recognized gastroscopically. If the involvement of the upper portions of the stomach is definite, then no further proof is necessary and gastroscopy thus may help to avoid unsatisfactory exploratory laparotomies. However, it is doubtful whether the presence of an area without carcinomatous infiltration is sufficient to warrant operability in more than a purely technical sense. Nothing destroys confidence in gastric surgery more than resections for cancer followed by early recurrence. Schindler (82), Giere (83), and Wirts (89) believe they can judge the operability of gastric cancer according to types which conclusion will be referred to later.

Schindler and Giere (83) tried to show the importance of gastroscopy for the surgeon. Their paper is based on 41 case reports. In 20 cases control by biopsy was possible. They came to the following conclusions:

"Although the gastroscopic diagnosis was confirmed in every case in which we had biopsy control, it must nevertheless be admitted that negative findings in gastroscopy are not entirely conclusive. The differential diagnosis between benign and malignant ulceration is not difficult to determine after a gastroscopic examination by one trained in this field, even in the very early

stage biopsy is not necessary. The differentiation between benign and malignant obstruction is more difficult but also possible. Gastroscopic diagnosis was proved to be correct in each instance (7 cases). The gastroscopic picture is more characteristic than is that of the gross specimen because of the circulating blood. The operability of carcinoma was best determined by gastroscopy (9 cases). Special attention is called to the fact that operation for gastric carcinoma frequently results in cure of long duration, particularly in cases in which the diagnosis is made early. Early gastroscopy together with an early roentgenogram is able to reveal operable carcinoma. Gastroscopy has proved to be superior to roentgen examination in certain cases. Theoretically in other cases roentgen examination should be superior. The 2 methods are not competitors; each supplements the other and good co-operation between the gastroscopist and the roentgenologist is essential. Early diagnosis of gastric carcinoma can be brought about if each patient over thirty-five years of age who suffers from anorexia or significant loss of weight in whom no other explanation for the symptoms is found is immediately examined gastroscopically and roentgenologically. Patients with atrophic gastritis or a benign tumor should be watched carefully by both methods. An unfavorable diffusely infiltrating carcinoma of the body of the stomach should be recognized by gastroscopy and excluded from operation. Exploratory laparotomy should be done only on those relatively few cases in which the operability is not definitely determined by gastroscopic examination. This will result in a greatly lowered surgical mortality and will thus help to dispel the prejudice which so many hold in respect to the surgical treatment of carcinoma. This should not only bring a greater number of patients with carcinoma to the operating table but also result in the observation of a greater percentage of cases in the early stage since a distinction will be made in the minds of the public between the prognosis of early and late cancer.

A colored plate illustrates the findings of the authors.

Again René Chevalier (24) made most valuable contributions to this subject. He described very early carcinomas of the pylorus diagnosed gastroscopically, and published a colored plate containing such characteristic pictures that one should look it up in the original.

In this review it is impossible to render adequately all important papers on the early diagnosis of gastric carcinoma read before the Second International Congress for Gastro-Enterology. A

short selection shall be given. Katsch (46), the outstanding German clinician, discussed the subject from the standpoint of general medicine. He emphasized, as did almost all subsequent speakers, the tremendous superiority of the x-ray examination and gastroscopy. Gastroscopy routinely used permitted surprising early diagnoses even in some cases in which the x-ray examination was negative. Katsch thinks that epigastric distress even if it does not suggest cancer, should be analyzed by means of x-ray examination and gastroscopy. Clinical observation of patients suffering from chronic gastritis would be essential. This last statement was also made by Kapp (45) who thinks that as yet x-ray examination and gastroscopy have not improved the early diagnosis of gastric carcinoma because the right material was not examined. He made a follow-up study in 157 cases of chronic gastritis and found that in 13 per cent a carcinoma had developed within from twelve to seventeen years. The chief speakers on the value of gastroscopy were Moutier and Henning. Moutier (61) subdivides the stomach in different regions. In his experience carcinoma in the region of the body of the stomach always has grown considerably before endoscopy becomes possible but in the antropyloric region an early gastroscopic diagnosis can be made. He then describes the characteristic endoscopic findings. Henning (37) said gastroscopy may have 3 different aims: (a) the completion of certain positive x-ray findings (the operability of a tumor is much better shown by gastroscopy than by x-ray examination and numerous explorations with their dangers may be avoided by gastroscopy); (b) the verification of doubtful x-ray findings; or (c) the exclusion or demonstration of a tumor following negative x-ray findings. Henning believes that the routine use of the gastroscope will be indispensable in the future in the early diagnosis of gastric carcinoma. Ralsky (66) found gastroscopic examination an invaluable guide as to whether the patient should be operated upon. Freeman (31) also emphasized that only x-ray examination and gastroscopy are valuable methods for the early diagnosis of gastric cancer, that nothing can be expected from the history, physical examination, gastric analysis or from a study of the stool. Juras (43), a radiologist, combined x-ray examination and gastroscopy in a manner worthy of imitation. Okada (64) and Netousek (63) described cases of early diagnosis of gastric cancer made gastroscopically. Bonadies (11) described difficulties encountered in the gastroscopic examination of gastric carcinomas, especially the obscuring of the tumor by hemorrhage and its non-visualization when situated in a "blind

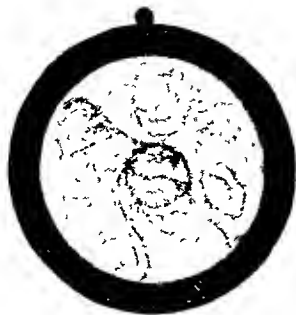


Fig 5



Fig 6



Fig 7

Fig 5 Gastroscopic view of severe verrucous ulcerative antrum gastritis. Three grayish-yellow ulcerations were seen lying in a thickened stiff nodular mucosa. Resection and microscopic examination revealed antrum gastritis.

Fig 6 Gastroscopic view of a sharply limited (Type 2) gastric carcinoma of the lesser curvature. The ulcer floor

was a dirty gray, the irregular nodular wall was red, sharply limited toward the surrounding pale pinkish mucosa (confirmed by operation).

Fig 7 Gastroscopic view of a black silk thread which has cut through the gastric mucosa of a postoperative stomach.

area." René Chevallier (26) mentioned the difficulties of an accurate early roentgenological diagnosis, contending that gastroscopy is the superior method in some cases. He described a characteristic gastroscopic syndrome he calls the "Etat cartonné leuco-atropho-amyxique." The rigidity of the infiltrated area is recognized earlier by gastroscopy than by x-ray examination. The color of the infiltrated area is a pale dirty white, often most outspoken in the prepyloric region. In contrast to ulcer there is an obliteration of the folds in early carcinoma. Finally the mucosa is dry, this is a very important early sign. Schindler and Wirts (89) decided to use the expression "early" diagnosis only for those carcinomas which permit a complete cure of long duration. With this as a premise, the presence or absence of symptoms and the site and size of the tumor seem irrelevant. Of importance are only the general condition of the patient, the absence of metastases, and especially the type of carcinoma. These authors accepted Bormann's subdivision into four types, which can be recognized readily by gastroscopy: the polypoid tumor, the localized ulcer, the infiltrative ulcer, and the diffusely infiltrative tumor (Fig 6). The 2 first types give a good prognosis, the third a doubtful one, and the fourth a bad one. The authors describe a case in which gastroscopy—by this typological diagnosis—proved to be definitely superior to x-ray examination, however, they recognize the equal importance of both methods. Konjetzny (52) again emphasized the multicentric origin of gastric carcinoma in a gastric mucosa, a view he has defended since 1914 and which now seems to be accepted generally.

The gastroscopic diagnosis of lymphoblastoma has been described by Renshaw (67).

THE POSTOPERATIVE STOMACH

Since Schindler's first publication in 1922 the importance of gastroscopic examination of postoperative stomachs has been fully recognized. Indeed, the diseases of the postoperative stomach, excepting some jejunal ulcers, are best or exclusively diagnosed by gastroscopy. Carey (15) states that "gastroscopy offers the only opportunity of seeing directly such changes in the gastric mucosa as are likely to result from a poorly functioning opening placed in the stomach as part of some operative procedure upon it. These changes include various types and degrees of gastritis and ulceration, and recurrence of malignancy." Schindler and Giere (83) base their conclusions on the observation of 28 patients, 7 of which again underwent operation after gastroscopy. A relatively normal stomach was seen only in 3 instances. Recurrent ulcer was found in 1 case and a jejunal ulcer in 2 cases, simple hemorrhagic erosions were observed twice. Silk sutures which had cut through the mucous membrane and were hanging free into the gastric cavity were observed 3 times (Fig 7). The most frequent disease of the postoperative stomach is chronic gastritis, it was observed in 15 cases. Gastroscopic examination was unsatisfactory in 4 cases. "An artificial stoma (after resection of gastro-enterostomy) may remain patent or may acquire pylorus-like rhythmic activity. Four stomas of the latter type were seen, 2 after resection and 2 after gastro-enterostomy. It seems quite certain that this pylorus-like adaptation protects the stomach against the development of postoperative gastritis. Although we do not know what conditions favor this development after resection, it does seem that gastro-enterostomies which are carried out in the posterior wall near

the pylorus and close to the greater curvature have a greater tendency to bring about this adaptation. Gastro-enterostomy has the further advantage that the stoma may be closed if necessary. The activity of the gastro-enterostomy stoma in those cases in which a functional adaptation has developed is not timed in the same rhythm as is shown by the pylorus. Silk sutures which have not been expelled into the cavity of the stomach several months after operation should be surgically removed since they irritate the mucous membrane causing chronic gastritis with painful erosions and may even play a part in the development of jejunal ulcers.

THE GASTRIC MUCOSA IN BLOOD DISEASES

The most outspoken changes of the gastric mucosa are found in pernicious anemia. Either the entire mucosa is completely atrophic, it shows atrophic patches or inflammatory changes are found. Jones, Benedict and Hampton (41) showed in a brilliant study that in some cases the apparently irreparable atrophic gastritis disappeared following liver therapy and that a real regeneration took place. This observation was confirmed by P. Chevallier and Moutier (18) and Lehmann (53). These French authors also observed gastroscopically the gastric mucosa in cases of hypochromic anemia. They as well as Morrison, Swalm and Jackson (57) found similar changes which however responded to iron rather than to liver therapy. Gastroscopy probably will play a great rôle in the observation of the effectiveness of therapy in these diseases.

The gastroscopic picture in the leucemias was studied especially by Gutzeit and Tenge (33). They found severe hypertrophic gastritis in the myeloid form, extensive atrophy combined with leucemic infiltrations in the lymphatic form.

FOREIGN BODIES

Foreign bodies of the stomach do not have great diagnostic significance. Those too large to pass the pylorus are extracted surgically, a few, such as safety pins in sucklings may be extracted through an open gastroscope (C and C L. Jackson 40 and Tucker 98). This technique has nothing to do with diagnostic gastroscopy and therefore will be omitted.

Moersch (55) diagnosed a phytobezoar gastroscopically. The tumor appeared gray in color, irregular in shape and definitely pit marked.

GASTROSCOPY AND X RAY EXAMINATION

The relation of the 2 anatomical methods of examination of the stomach has been discussed in

the textbooks quoted earlier. Each gastroscopist checked his results carefully with the most refined roentgenological methods in order to elicit the limits and advantages of each method. Roentgenologists hesitated a long time before they drew a similar advantage from co-operation with the gastroscopists. This was true especially in Europe where for fourteen years the roentgenologists were loath to consider gastroscopy as an important method. In the United States however through the co-operation of Schatzki with Benedict and of Templeton with Schindler, the situation became different. The result was an extensive discussion before the twenty second annual meeting of the Radiologic Society of North America. The impression of the papers and the following discussion then was summarized by Rieger (63) from the standpoint of the roentgenologist in a brilliant editorial. He wrote "First of all it should be clearly understood that the gastroscopic examination supplements rather than competes with the roentgen examination of the stomach. An adequate roentgen study is an absolute prerequisite for an intelligent, conservative endoscopic examination. The practice of gastroscopy in any community should stimulate an additional interest in diseases of the stomach. Hence, it seems probable that the introduction of this procedure will increase rather than decrease the number of gastrointestinal cases referred to the radiologist. Secondly gastroscopy creates a new stimulus and a new guide for the activities of the roentgen diagnostician. At one time surgery was the chief factor in the discipline, so necessary to keep us from degenerating into smug complacency. The decline of surgical intervention in non-tumorous lesions of the stomach together with the realization that inspection and palpation of the exterior of the stomach give no final assurance of the presence or nature of a lesion has somewhat modified the salutary effects of laparotomy for determining the value of roentgen conclusions. The development of another method of examination should give the radiologist another desirable control for the accuracy of his findings. Finally and to the radiologist most important of all, the endoscopic study of the stomach may prove to be an educational force of considerable importance. The unsatisfactory character of the usual gross and histological investigation of the pathology of gastric diseases is well known. The results to this date indicate that longer experience with direct inspection of the gastric mucosa in the living individual will teach us many facts about those diseases particularly gastritis which prior to this time have been difficult to elucidate. The gastroscopic observation of mu-

cosal erosions, gastric ulcers, and the various types of gastric tumors should prove of great value in establishing anatomical data to guide us in the interpretation of roentgen observations." It does not seem possible to express the relation of the two anatomical methods with better words.

Kirklin (50), from a theoretical standpoint, compared also the relative merits of gastroscopic and roentgenological examinations. Later, he with Ansprenger (1) published a special, very valuable paper on the roentgenological aspects of chronic gastritis based partly upon comparative gastroscopic studies. The authors came to the conclusions that only a small percentage of cases of gastritis can be diagnosed by roentgen examination, by the demonstration of stiff folds or of the warty granulation of the relief, and that mucosal atrophy cannot be demonstrated by roentgen examination. Schindler and Templeton (88) systematically compared findings of the relief method with gastroscopic observations. They described some of the differences that occur between gastroscopic and roentgenological examinations and offered explanations as to why they exist. Benedict (8) again stated that gastroscopy should not be used as a substitute for x-ray examination, but should be employed as an adjunct to it. Schatzki (74), from the roentgenological standpoint, came to the following conclusions: "If one should be asked to renounce either gastroscopy or roentgenology one would without doubt prefer to keep roentgenology, but the question is wrong in itself. Gastroscopy is an important supplementary method. A diagnostic problem may be difficult to solve by roentgenology and may be no problem at all for gastroscopy and *vice versa*. The correlation of the findings by the two methods has increased our knowledge of the normal and diseased stomach and has helped us in many individual cases." Schloss, Ettinger, and Pratt (91) in the summary of their comparative studies came to results still more favorable for gastroscopy. "For the diagnosis of gastritis, gastroscopy is by far superior to x-ray relief technique. For the diagnosis of stomach tumors and of postoperative changes, x-ray relief methods and gastroscopy supplement one another in an almost ideal way." Templeton and Schindler (96) discussed special problems of ulcer and gastritis as studied by both x-ray examination and gastroscopy. Jutras (43) gives the example of a radiologist who himself practices gastroscopy with excellent results.

Almost all authors agree that x-ray examination should precede gastroscopy. Schindler (82) alone thinks that such a procedure often is not practical,

although he considers x-ray examination indispensable in any instance. At least four days must elapse between the x-ray examination and gastroscopy because barium may often stick between the folds and on small erosions for that period of time, gastroscopy disappoints when carried out too early. However, patients, especially out-of-town patients, with minor distress are not willing or able to wait such a long time and in order not to spoil the chief goal, early recognition of a very small cancer, the gastroscopy should then precede the x-ray examination. Then both examinations may be carried out on the same day, the roentgenological immediately following gastroscopy. When sufficient time is available the reverse order is recommendable.

GASTROPHOTOGRAPHY

It is a sad task to review the literature on gastrophotography. Little can be found of the critical spirit with which gastroscopy and the x-ray relief method were built up.

We are badly in need of a recording of the pictures seen with our gastroscopes. The medical world is accustomed to the permanent records of roentgenology by which the results of fluoroscopy may be controlled. Moreover, observation of the quickly moving picture in gastroscopy is difficult, the occasional onlooker does not see anything at all and is inclined to doubt the findings described by the gastroscopist. Elsner and Henning, therefore, have photographed the interior of the stomach through rigid gastroscopes, Henning with excellent results. Although he and Schindler were able to picture the relief of the interior of the stomach and to adequately represent folds, nodules of hypertrophic gastritis, tumors, and such structures as the musculus sphincter antri, the contrast of colors was not shown by the most sensitive black and white films. Gray or yellow ulcerations were not visible.

The pictures obtained with the so-called gastrophotor do not have the slightest likeness to the pictures seen at gastroscopic examination. The gastrophotor consists of a small camera with pinhole openings which when introduced into the stomach exposes eight films. The interior of the stomach is illuminated by a brilliant light. The pictures obtained in this way are mostly lunar landscapes. There is no similarity to the pictures obtained by photography through rigid gastroscopes. Occasionally the contour of folds or of a tumor, or a gastro-enterostomy is seen. Usually the picture is hopelessly blurred and numerous highlights prevent a demonstration of the mucosal surface. Many artefacts appear and the trained

gastroscopist does not know whether he should laugh or become indignant at the diagnoses made according to these artefacts. Spots which, as the expert knows, are air bubbles or even just dust obscuring the optical system are described as 'ulcers' and confirmed by operation. For instance one may look up in the paper of Kohn (51) the pictures 2 3 4 5 6 9 and 10 to become convinced that here we have to deal with just a toy, though an expensive one. The gastroscopist can not draw sharply enough the line between this kind of science and gastroscopic research. Also the hopes I put on a development of the optical system have, in the gastrophotors, not been fulfilled. The pictures published by Garin and Bernay (33)—the best and most critical advocates of gastrophotography—are not much better than Bernay's pictures in 1931.

Anyhow, we need lasting documents. Today photography is not yet feasible through a flexible gastroscope. This is only a question of time. Light bright enough to illuminate the films must be found, films sensitive enough to record the finest nuances of color have to be invented. The old Henning camera already can be attached to the flexible gastroscope (Moutier, 61). Kimura (49) has constructed a new photographic attachment. Neither yields satisfactory pictures as yet. Colored films will be tried which, however, will need still much more light.

After a highly satisfactory gastroscopic technique has been reached, after a new gastric pathology based on a comparison of the x ray and gastroscopic findings has been developed, the next step will be to find a method which will enable us to record our findings permanently.

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SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Fallis L S	Direct Inguinal Hernia	<i>Ann Surg</i>
1918 107	572	

The author believes that the poor results of operation for the repair of direct inguinal hernia are directly attributable to the employment of methods which are satisfactory for indirect hernia but unsuitable for the direct variety because of the different problems involved. He finds that next to the umbilicus Hesselbach's triangle is the weakest point of the abdominal parietes. This area receives support from the peritoneum and properitoneal fat posteriorly and from the conjoint tendon anteriorly. The author finds that in many cases a large external inguinal ring precedes the formation of a direct inguinal hernia. There are however several anatomical variations in these patients which would lend weight to the theory that the direct hernia is congenital or at least that there is a congenital predisposition to it. The aponeurosis of the external oblique muscle is usually intact but the rectus muscle is much narrower than normal. The fleshy fibers of the internal oblique and transversal muscles arch upward to unite at the edge of the rectus muscle and enter its sheath and the conjoint tendon is either rudimentary or absent. Thus the integrity of the transversal fascia constitutes the only barrier against the formation of the hernia.

The author believes that the diagnosis of the type of hernia direct or indirect can often be made clinically by the palpation of the floor of Hessel.

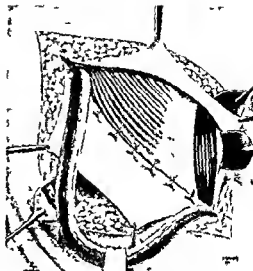


Fig. 2

back a triangle through the subcutaneous inguinal ring. The incidence of direct hernia has increased from 15.7 to 25 per cent in the last decade which the author attributes to the more rigid pre employment examinations which are now being performed.

The repair of the direct hernia is a plastic procedure which must be directed toward the utilization of all available tissue to the best advantage and the avoidance of suture under tension. The author exposes the spermatic cord and opens the cremaster muscle. He then opens the sac in the manner described by Hogue. This is accomplished through the location of the small potential indirect sac which is constantly present in intimate relation to the vas. This sac is opened and the finger inserted into the peritoneal cavity and out through the sac of the direct hernia (Fig. 1). Traction is now put on the indirect sac by the brushing away of the preperitoneal fat which brings into view first the deep epigastric vessels and then the obliterated byogastric artery until the bladder appears in the wound. It will now be found that the entire direct sac lies lateral to the deep epigastric vessels and can be ligated. The rectus muscle is sharply retracted medially to pick up the intact portion of the transversal fascia which is sutured to Poupert's ligament. The author then dissects the aponeurosis of the external oblique muscle free from the rectus sheath which he states can readily be done as it is inserted to the linea alba. An incision is now made in the rectus sheath in a vertical direction upward from the pubis for two or three inches. This permits the approximation of the firm

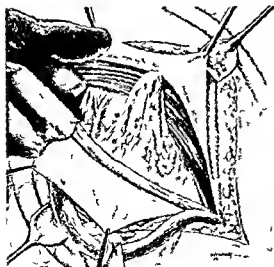


Fig. 1

fibrous lateral edge of the rectus sheath to Poupart's ligament without tension. The aponeurosis is now umblicated under the spermatic cord, and serves to cover the rent in the rectus sheath (Fig. 2).

The author has been able to follow up 154 of 251 patients who were operated upon for direct hernia for a minimum period of two years. Among these there had been 18 recurrences (11.6 per cent).

WILLIAM C. BECK, M.D.

Klein, W.: Non-Specific Mesenteric Adenitis: A Report of 140 Cases. *Arch. Surg.*, 1938, 36, 571.

The anatomy of the mesentery of the small intestine is reviewed. The mesentery of the terminal portion of the ileum differs in important details from that of the rest of the intestine. The last 6 cm. of the mesentery of the ileum is free from glands, its fibers converge from left to right, and no vessels traverse this space. It is often called the avascular space of Treves. The lymphatic drainage of the intestines is accomplished by means of two sets of vessels, one originating in the mucosa and submucosa, and the other in the muscularis and subserosa.

The author performed experiments on living subjects in the course of laparotomies on both animals and human beings. A 1 per cent solution of indigo carmine was injected into the subserosa of the ileum and the distribution of the dye in the lymphatic channels was observed. The drainage from the lowermost part of the ileum (corresponding to the avascular space of Treves) was from left to right. The lymphatics ran to the satellite nodes of the ileocecal artery.

The lymphatics of the appendix are not independent of those of the cecum. The latter has two sets of lymphatics, one set emerging from the anterior wall and another set emerging from the posterior surfaces. Both run toward the ileocecal chain directly or through the intermediary of the anterior and posterior cecal glands. A number of lymphatic glands are found in the ileocecal angle that drain the appendix, the cecum, and the lowermost small segment of the ileum. These drain along the mesenteric artery, emptying into the chain near the third portion of the duodenum.

The pain of mesenteric adenitis is not easily explained. A possible explanation is that inflammation and hyperplasia of the glands cause pressure on the sensory pacinian capsules in the mesenteric leaves, or perhaps these sensory organs are directly invaded by toxins.

The cause of mesenteric adenitis is absorption of toxins from the intestinal tract. These toxins may be of bacterial origin or may be the products of digestion. The statement that mesenteric adenitis is preceded by an infection of the upper respiratory tract is not borne out by careful histories and close observation, and is also contrary to the normal physiology of the animal body. The fact that mesenteric adenitis is always accompanied or immediately preceded by inflammation of the intestines, as observed at operation, is further evidence that

this form of adenitis is a direct result of pathological conditions in the intestines. There is, however, a small group of cases of very acute involvement in which infection of the upper respiratory tract occurs simultaneously with mesenteric adenitis. In these cases it is perhaps a general toxemia that brings the toxins to the intestines via the blood stream and causes inflammation with consequent glandular hypertrophy. In only 8 per cent of the author's series was there a history of a preceding upper respiratory infection.

The author classifies non-specific mesenteric adenitis into three types according to the symptomatology, which he describes in detail. The first group is the least common, and occurs in children from six to twelve years of age. The onset is sudden with high fever, marked toxemia, and a high blood count. The face is flushed, the pulse rapid, and the throat congested and inflamed. The abdomen is distended and tender throughout, especially in the right lower quadrant. When operated on, the whole intestinal tract, particularly the small intestines, is thickened and extremely red, and the mesenteric glands are deep pink. The second type is most common and is often mistaken for appendicitis. However, the tender point in the right lower quadrant is at a higher level than in appendicitis and is internal to McBurney's area, and when the patient is turned on the left side, the tender area is shifted to the left and is absent on the right. This one sign, when present, has always differentiated mesenteric adenitis from acute appendicitis. The third type of mesenteric adenitis described by the author gives the same history as the second, but examination of the abdomen discloses that whereas the tenderness can be shifted from right to left with change of position, tenderness over the cecum persists. This type cannot always be differentiated from a pathological process which involves the appendix. The operative findings in the second and third groups are also described in detail.

The author concludes that

1 Mesenteric adenitis is much more common than is generally recognized.

2 A diagnosis is possible in a majority of cases.

3 Mesenteric adenitis is not necessarily an accompaniment of an infection of the upper respiratory tract.

JOHN H. GARLOCK, M.D.

GASTRO-INTESTINAL TRACT

Walters, W.: Chronic Gastric Ulcer. *Am. J. Surg.*, 1938, 39, 62.

The similarity of the syndromes associated with benign gastric ulcer and with benign duodenal ulcer has led to the thought that they are lesions of similar type. They differ, however, not only from the standpoint of the type of tissue in which the ulceration occurs, but also from that of the variable pathological nature of the lesions themselves, and from that of their response to both medical and surgical treatment.

Of first importance when a patient presents himself with a history suggesting benign ulceration of the stomach or duodenum is that roentgenological examination be made by a competent roentgenologist to determine the exact situation of the lesion. If the lesion can be proved by roentgenological examination to be in the duodenum and if a medical regimen is chosen for treatment the possibility of the duodenal lesion's being or becoming malignant is practically non-existent. In dealing with gastric ulcers at the Mayo Clinic the author proceeds on the assumption that chronic ulcerating gastric lesions are malignant until they are proved to be benign.

The treatment of gastric ulcer is dependent on several factors among which are: (1) the duration and type of symptoms; (2) the healing of the lesion or its failure to heal under a medical regimen carried out in a scientific fashion; (3) the presence or absence of a crater especially with respect to bleeding; and (4) the presence or absence of pyloric obstruction.

When the symptoms have been of short duration and the ulcer is small every attempt should be made to induce healing of the lesion by non-surgical means. When roentgenological examination discloses that the ulcer has a demonstrable crater especially when episodes of bleeding have occurred, when the lesion is producing pyloric obstruction or when it is prepyloric in situation or is on the greater curvature generally speaking surgical removal of the lesion should be undertaken without delay. The fact that an ulcer of the stomach is reported by the roentgenologist to be probably benign does not exclude the possibility that the lesion is carcinomatous. The roentgenologist wishes such an opinion of his to be considered only as a contribution to the final diagnosis.

In our experience at the clinic each year a considerable percentage of patients operated on for carcinoma of the stomach have related, in their early histories, symptoms indistinguishable from those of benign ulceration.

The types of operation available in the treatment of gastric ulcer consist of: (1) partial gastrectomy followed by anastomosis of the stomach and duodenum (Billroth I) or of the stomach and jejunum (Polya-Balfour); (2) excision of a portion of the stomach containing the gastric ulcer or destruction by cautery of the gastric ulcer in some cases combined and in other cases not combined, with gastro-enterostomy; (3) transgastric excision of the ulcer from the posterior wall of the stomach; and (4) sleeve resection of the stomach.

The type of operation to be selected for each case is dependent on the type of lesion, its size, situation and accessibility, the amount of deformity of the stomach that would result from its removal and the general condition of the patient. In selection of the type of operation most suited to the patient or the lesion the following general statement seems justified: partial gastrectomy, particularly for large gastric ulcers with either a Billroth I or a Polya

or a Polya-Balfour type of anastomosis is the preferable procedure, provided it can be performed with a mortality as low as 3 or 4 per cent. The reasons for this are: (1) the prompt relief of symptoms; (2) the almost total absence of recurring ulceration; and (3) the fact that partial gastrectomy is the preferable procedure should the lesion prove to be malignant.

There is a place for destruction of the ulcer by cautery, or for segmental resection of a portion of the stomach containing the ulcer either operation combined with gastro-enterostomy. Whereas in the author's experience the mortality of partial gastrectomy for large gastric ulcers has been approximately from 3 to 4 per cent, destruction by cautery or excision of a gastric ulcer combined with gastro-enterostomy, usually can be performed with a mortality not greater than that of gastro-enterostomy. The working principle can be accepted that excision or destruction of small gastric ulcers by cautery combined with gastro-enterostomy is a suitable operation of low risk and partial gastrectomy an operation of greater risk can be reserved for the large penetrating frequently hemorrhagic gastric ulcer.

During 1936 partial gastrectomy for benign and malignant lesions of the stomach and duodenum was performed in 213 cases. Of these operations 104 were for benign lesions, with a mortality of 3.8 per cent. In 33 cases the operation was a primary partial gastrectomy performed for gastric ulcer. An additional 5 patients had undergone gastro-enterostomy previously in these 5 cases therefore in addition to partial gastrectomy, removal of the gastro-enterostomy and closure of the jejunal opening was carried out.

In the cases of 25 patients in whom gastric ulcers were removed by local excision combined with gastro-enterostomy or destruction by cautery no deaths occurred. On only 2 occasions in the last three years has the author been satisfied to perform segmental resection of a portion of the stomach containing the ulcer without also performing gastro-enterostomy. Excision of the ulcer and sleeve resection of the stomach were employed infrequently.

On the basis of roentgenological examination gastric ulcers situated high on the lesser curvature and situated high on the posterior wall of the stomach are frequently reported to be of questionable accessibility to surgical removal. Their high situation is likely to be considered an additional reason for continuation of the medical treatment which has failed to cause healing of the ulcer previously. The fact that all benign gastric lesions are accessible to surgical treatment deserves emphasis.

The results of a properly chosen properly performed operation for gastric ulcer are: some of the best in surgery and recurrence of the ulcer or disturbing symptoms without formation of an ulcer are practically never encountered. This is true especially when the operation performed is partial gastrectomy.

Rife, C. S.: Gastrojejunocolic Fistula. *Am J. Surg.*, 1938, 39 73

This report is based upon 14 cases of gastrojejunocolic fistula. The original lesion was a duodenal ulcer in 13 of these patients. An extensive carcinoma of the stomach extending into the transverse colon was the primary causative lesion in the fourteenth case.

Hyperacidity was believed to play a major rôle in the production of not only peptic ulcer but also jejunal ulcer. Rife, however, notes that although duodenal ulcers are more likely to be associated with higher acids than gastric ulcers, and gastrojejunal ulcer and fistula are much more common following operations for duodenal ulcer, "all the blame for these complications cannot be attributed to hyperacidity for duodenal ulcers are much more common than gastric ulcers. Gastrojejunal ulcer and fistula are practically unheard of in patients in whom the gastroenterostomy was done for unresectable carcinoma of the stomach." This fact is probably explained by the anacidity or very low acidity present in carcinoma of the stomach. Tight intestinal clamps cannot be held as a causative factor because the jejunal ulcer usually occurs in that portion of the jejunum not gripped by the clamps and the interval between operation and the onset of ulcer symptoms may be several years.

The work of Hurst and Stewart is presented as contributory evidence supporting this theory on etiology. These investigators performed autopsies on 141 patients who had had operations for ulcer. In this group there were 46 patients who had died within ten years postoperatively and none of these showed evidence of jejunal ulcer at autopsy. In another group of 43 patients whose deaths occurred nine or more months postoperatively, there were 22 cases of jejunal ulcer.

Non-absorbable suture material has also been held responsible for the production of anastomotic ulcers, but this theory has been largely abandoned. The complication is still highly prevalent in spite of the use of absorbable material.

Fistula, of course, practically always is a complication of posterior rather than anterior gastroenterostomy. The inflammatory process in the jejunum extends well down into the root of the mesentery near the ligament of Treitz, making resection of the fistula very difficult. In the majority of cases the fistulous tract connects the jejunum and the transverse colon. A direct connection between the stomach and colon is uncommon. Ulceration of the tract itself is unusual and there may be no active marginal ulcer, especially in those cases in which the communication between the jejunum and colon is located quite distal to the gastro-enterostomy stoma. The fistulas are nearly always single, usually from 4 to 6 cm long. The efferent loop of jejunum is usually dilated and hypertrophied. The colon may be constricted at the site of the fistula and dilated approximately to this point, simulating intestinal obstruction.

The symptomatology usually consists of a diarrhea of watery or semiliquid stools containing liquid fats which are usually very foul-smelling. Vomiting may occur but fecal vomiting is unusual. Foul-smelling eructations are, however, fairly characteristic. The type of pain is not characteristic. Anorexia and loss of weight are usually present.

The diagnosis can be made by careful roentgenological study and "if barium is present in the colon shortly after leaving the stomach, the diagnosis of gastrocolic or gastrojejunocolic fistula may be postulated with certainty." If a fistula is suspected it may be confirmed by a barium enema.

The treatment is surgical and varies from simple closure of a fistula with restoration of the normal gastro-intestinal continuity to extensive "en bloc" resection in which the involved loop of jejunum, part of the colon, and the pyloric antrum are resected. Early operation is indicated but the importance of adequate pre-operative preparation of the patients with gastrojejunocolic fistula cannot be overemphasized. There usually is a marked loss of body weight with noticeable alteration in the body chemistry. Dehydration, acidosis, alkalosis, hyperchlorosis, ketosis, and avitaminosis may all be present and should be restored as nearly to normal as possible before the operation is attempted.

SAMUEL J. FOGELSON, M.D.

Cace, M.: Primary Tumors of the Duodenojejunal Tract. Lymphogranuloma of the Duodenum (Tumori primitivi del tratto duodeno-digunale Linfogranuloma del duodeno). *Radiol. med.*, 1938 25 365

Cace states that among the various malignant tumors of the gastro-intestinal tract, those of the duodenum are exceedingly rare. In a series of 500,000 autopsies an incidence of only 0.3 per cent has been reported. Malignant neoplasms of the jejunum, however, are less rare, their incidence being about 1 per cent. It is not surprising that the diagnosis of malignancy of the duodenum is exceedingly difficult in the live patient.

The first roentgenological reports of these lesions were incomplete and inadequate. The author had the opportunity in 1933 and 1934 to observe 6 patients presenting malignant lesions of the upper intestinal tract. These lesions were all localized below the insertion of the mesocolon and above the ileum, four of the tumors were localized at the second portion of the duodenum, 1 was localized at the papilla of Vater, and 1 was found to involve the first loops of the jejunum. Five of the tumors were carcinomas and the sixth represented an inflammatory hyperplastic process of probable lymphogranulomatous character.

On the basis of clinical and roentgenological studies of these cases, Cace concludes that primary malignant tumors of the duodenum may cause a more or less extensive stenosis. The mucosal outline is lost, the elasticity is decreased, and peristalsis is abolished. The stenosis is accompanied by a tumor-

faction of this portion of the intestine which in turn gives rise to pressure effects upon the duodenum and the antral portion of the stomach without causing however alterations of the pyloric outline and the duodenal cap. Important diagnostic signs in this respect are the absence of perivisceritis of the adjacent organs and a well delimited area of stenosis with the reappearance of the mucosal outline just beyond that portion of the duodenum which has not been invaded by the neoplastic process.

The aforementioned stenosis may be accompanied by the appearance of more or less extensive filling defects and in this case the intestinal wall presented an irregular or circinate contour. In some cases there may be roentgenological evidence of small or large ulcers presenting ragged borders. Duodenobiliary fistulas have also been visualized in these conditions.

According to the author, tumors originating at the papilla of Vater are characterized by their flame like appearance. This finding is of greatest importance in the diagnosis of a malignancy involving the papilla of Vater.

Concerning the roentgenological evidence of malignant tumors of the jejunum the author's findings conform fully with those expounded by Possati who first described these lesions roentgenologically.

RICHARD E. SOMMA, M.D.

Bower J. O. The Lucid Interval and Acute Appendicitis. *Am. J. W. Sc.* 1938 195 529.

In reviewing the results obtained during the past four years in the management of patients suffering from acute appendicitis complicated by spreading peritonitis the author found that in every instance where death occurred the surgeon did not diagnose the condition pre-operatively. The most frequent error was the failure to recognize early perforative peritonitis. The second most frequent error was inability to diagnose the gangrenous appendix in the preperforative state. Examination of clinical records too often has shown that the patient gave a typical history of appendiceal colic and that the physician finding tenderness in the lower right quadrant made the diagnosis of appendicitis but before admission of the patient to the hospital all signs and symptoms had disappeared except for a moderate elevation of temperature. Without exception, the lesion responsible for this lucid interval was partial or complete appendiceal gangrene.

The lucid interval as used in connection with gangrenous appendicitis is the symptom free period preceding perforation and is dependent upon factors which influence intra-appendiceal pressure. The subsidence of pain, remission of temperature, the absence of tenderness and the increased tension or rigidity are due in part to a reduction of intra-appendiceal pressure. The symptoms and signs accompanying an acutely inflamed appendix prior to the development of gangrene are associated with and partially dependent upon increased intra-appendiceal pressure.

The diagnosis of the preperforative stage of acute appendicitis is dependent upon the following:

1. A complete history.
2. A thorough physical examination.
3. The physical findings in the patient of the physician who first examined him which should be noted on the clinical record.
4. A careful differential blood count with observations on the ratio of mature to immature neutrophils and also the relative number of degenerated immature forms.

In defense of the family physician it must be admitted that in many instances either because of the influence of relatives or friends patients refuse to accept his advice. To protect himself consultation with a surgeon should be advised. Every physician no doubt has had the experience of permitting the wishes of a patient to interfere with what he thinks should be done. Most patients will consent to operation but there are a few who doubt its necessity and are anxious to avoid it. These reluctant patients usually give an accurate history but will not admit that abdominal tenderness and pain is present on palpation.

In conclusion the author states that the high mortality of spreading peritonitis complicating acute perforative appendicitis (from 27 to 40 per cent in the United States) is in part due to the failure of physicians and surgeons to diagnose accurately the acute lesions of the appendix in both preperforative and early postperforative states. Partial or complete gangrene of the appendix is frequently associated with a subsidence of symptoms and an absence of physical signs. This is a so-called lucid interval and is often confused with the resolution following an acute involvement of the appendix of less virulent character. The subsidence of symptoms and signs accompanying both is due to diminished intra-appendiceal pressure. This is caused by the relaxation incident to desiccation of the serosa in the first instance and by the absorption of the products of inflammation in the latter.

In this article the author has endeavored to emphasize pertinent points which may aid in the recognition of this lucid interval.

JOHN A. LEE, M.D.

Altmeppen W. A. The Bacterial Flora of Acute Perforated Appendicitis with Peritonitis. *Ann. Surg.* 1938 107 517.

The author reports the study of the bacterial flora both aerobic and anaerobic of the purulent peritoneal exudates secondary to acute perforated appendicitis.

The cases included in this study were those of local peritonitis, general or diffuse peritonitis, and abscess. Sixteen different species of aerobic microorganisms were isolated from the peritoneal exudate. Only one negative aerobic culture was obtained. *Bacillus coli* has been repeatedly reported and was recovered most frequently. It was found alone or in association with other bacteria in 79 per cent of

the cases. Some form of streptococcus was present in approximately 44 per cent of the cases. A pure culture of one aerobic organism was obtained in 24 instances. The most frequent combination of aerobes was bacillus coli and a non-hemolytic streptococcus.

Anaerobic micro-organisms were cultivated in 96 of the 100 cases of peritonitis studied. At least 18 different species of anaerobic bacteria were recovered from the purulent exudates. It is of especial significance to note the fact that bacillus melanogenicum was cultured from the peritonitis exudate of 89 cases, or 92.7 per cent of the total number of cases yielding positive anaerobic cultures. As far as the writer has been able to determine, this bacterium has never been described before in the purulent peritoneal exudate secondary to acute perforated appendicitis.

In a comparison of the flora in the fatal and non-fatal cases, little difference is found in the type of species present. The bacillus coli, bacillus melanogenicum, and anaerobic streptococcus were recovered from each of the 6 fatal cases. Comparing the flora of the original peritoneal exudate with that of its secondary and metastatic abscess complications, the writer found essentially the same organisms in each instance.

It is not surprising that the bacterial flora found in the peritoneal exudate resulting from a perforated appendix is so complex and varied. Any perforated lesion in the region of the appendix or cecum necessarily results in contamination of the peritoneal cavity by a large number and variety of organisms resident in the intestine at the time of perforation. Many of these bacteria grow prolifically in the peritoneal cavity. When cultured outside the body, they grow best in close association or symbiosis with each other. It may be said that the bacterial flora of these patients presented a very complicated and bizarre picture, contrary to the generally accepted idea that bacillus coli and the streptococcus are the chief causative agents of appendicitis with peritonitis.

JOHN W. NUZUM, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Ochsner, A., DeBaakey, M., and Murray, S.: Pyogenic Abscess of the Liver. II. An Analysis of 47 Cases, with a Review of the Literature. *Am J Surg*, 1938, 39: 292.

During the ten-year period from 1928 to 1937, inclusive, 186 patients with abscess of the liver were admitted to the Charity Hospital and the Touro Infirmary in New Orleans. Of this number, 139 (74.7 per cent) presented amebic abscesses and 47 (25.2 per cent) pyogenic. This report is based upon an analysis of the latter, and 830 cases of pyogenic hepatic abscesses collected from the world literature.

The sex incidence of pyogenic hepatic abscess reveals a preponderance of occurrence in the male and this is probably explained by the fact that the etiological agents occur more frequently in the male. In a collected series of 830 cases of liver abscess,

there were 560 (67.4 per cent) males and 270 (32.5 per cent) females. In the authors' series of 47 cases there were 33 (70.2 per cent) males and 14 (29.7 per cent) females. The greatest age incidence is from the third to the fifth decade. No significant racial predisposition was found.

Pyogenic hepatic abscesses are the result of invasion by pyogenic micro-organisms and can occur in the following ways:

- I Transportation of virulent micro-organisms through the portal vein from areas drained by the portal system
 - A Appendix
 - B Rectum
 - C Other portions of the bowel
- II Extension from contiguous diseased processes
 - A Cholecystitis and cholangitis
 - B Gastric and duodenal ulceration
 - C Subphrenic space infection
- III Trauma
 - A Penetrating injuries with the introduction of micro-organisms from without
 - B Subcutaneous injuries producing devitalization of liver tissue and permitting growth of micro-organisms already present in the liver
- IV Blood-borne infections with the production of metastatic abscesses, the micro-organisms being transported through the hepatic arteries

Undoubtedly, one of the most frequent antecedent lesions in pyogenic abscess of the liver is suppurative appendicitis which is complicated by portal thrombophlebitis (pyelephlebitis). Whereas, in a collected series of 575 cases, there were 197 (34.2 per cent) cases in which appendicitis was the etiological agent, in the authors' series of 47 cases appendicitis was the exciting lesion in only 5 (10.6 per cent). This discrepancy is accounted for by the fact that the majority of the reports in the literature represented primarily the authors' interest in pyelephlebitis and liver abscess as complications of appendicitis. This is corroborated by the fact that in those series of cases which include pyogenic liver abscess due to all causes, the incidence of appendicitis more nearly approximates that in the authors' cases. The incidence of portal thrombophlebitis and liver abscess following appendicitis varies from a little more than 1 per cent to less than 0.1 per cent. In a collected series of 68,198 cases of appendicitis, there were 247 cases with these complications, an incidence of 0.36 per cent. In the authors' series of 5,293 cases of acute appendicitis during the ten-year period, there were 5 cases complicated by liver abscess, an incidence of 0.094 per cent. Pyogenic liver abscess can be caused by lesions in the portal area other than appendicitis. Such lesions include gastro-intestinal ulceration, diseases of the rectum, spleen, and the pancreas. In the collected series of 575 cases, these formed 10.2 per cent of all causes, and in the authors' series, 8.4 per cent. Cholecystitis was found to be the cause in 14 per cent of the

collected cases and in 6.3 per cent of the authors. Trauma was the etiological agent in 2.9 per cent of the collected cases and in 10.6 per cent of the authors.

There is a relatively large group of pyogenic hepatic abscesses in which the antecedent lesion can not be determined and which for this reason have been termed 'cryptogenic', 'idiopathic' or 'primary' pyogenic liver abscesses. Whereas in the collected series of 575 cases this group constitutes 17 per cent in the authors series of 47 cases it represents the largest number, 59.5 per cent. It has been suggested that such abscesses are the result of hematogenous infection due to distant foci which may be so inconspicuous as to be completely overlooked or that in most of these cases the microorganisms are transported through the portal vein and the antecedent lesions in the portal area are of such minor character that they are not recognized clinically.

The organisms most frequently found in pyogenic hepatic abscesses are the bacillus coli, the streptococcus, the staphylococcus or a combination of these. In a collected series of 184 cases, the bacillus coli was found to be the causal agent in 30.4 per cent, the streptococcus in 26.6 per cent, the staphylococcus in 26 per cent and a combination of these in 13.5 per cent. In the authors series of 29 cases which were studied bacteriologically, these incidences were 31, 20, 17.2 and 17.2 per cent respectively.

The pathological characteristics of pyogenic hepatic abscess consist usually of an enlargement of the liver, a perihepatitis due to involvement of Glisson's capsule and multiple abscesses scattered throughout the liver substance or in some cases more or less confined to particular sections, the left lobe escaping involvement more often than the right. The necrotic areas may vary in size from a fraction of a millimeter in diameter to a centimeter or more. By coalescence small abscesses form larger cavities or in some cases adjacent necrotic areas impart a honeycomb appearance to the diseased organ. Cellular necrosis characterizes the areas of abscess formation, the central portions of larger lesions containing practically nothing but cellular detritus while a fibrous capsule bounds the periphery. Microscopically in pyelophlebitis round cell infiltration of the venous wall is seen and leucocytes and cellular detritus are present in the lumen. Adjacent liver cells exhibit reaction to the inflammatory process with various stages of degeneration usually being demonstrable.

Whereas in the collected series of pyogenic hepatic abscess only 28.8 per cent were single in the authors series 54.5 per cent were single. In the collected cases the right lobe alone was involved in 41.8 per cent, the left lobe in 4.8 per cent and both lobes in 53.2 per cent. In the authors series these incidences were 63.1, 2.2 and 17.2 per cent respectively. Whereas in the collected cases 71.1 per cent were multiple in the authors series only 45.4

per cent were multiple. This discrepancy is probably due to the considerably greater incidence of appendicitis in the collected cases.

The clinical manifestations of pyogenic hepatic abscess may be divided into two groups: systemic and local. The most frequently encountered systemic manifestations are fever, pain, chills, and profuse sweating. Less frequently malaise, anorexia, loss of weight, weakness, nausea and vomiting occur. In the classical multiple liver abscess associated with pyelophlebitis and suppurative appendicitis, fever is characteristically of the picket fence type and is usually accompanied by daily chills. Of the local manifestations tenderness in the hepatic area and liver enlargement are the most constant. In a series of 286 collected cases, fever, pain, tenderness and liver enlargement were present in 95.8, 92 and 89.3 per cent respectively. In the authors cases these incidences were 93.6, 91.4 and 61.7 per cent. Characteristically there is a leucocytosis with a proportionate increase in polymorphonuclear leucocytes. This is in contrast to the findings in amebic hepatic abscess in which there is a moderate increase in leucocytes. In the authors series the average leucocyte count in the acute cases was found to be 26,924 whereas in the chronic cases it was 14,077. In the chronic cases of pyogenic hepatic abscess there is usually an associated secondary anemia. The characteristic roentgenological changes are elevation and immobility of the diaphragm, usually on the right side. The diagnosis was positive in 82.1 per cent of 3 cases in the authors series in which roentgenological studies were made.

Aside from the virulence of the organism and the resistance of the host, the prognosis in pyogenic hepatic abscess depends upon (1) the multiplicity of the lesions and whether there is an associated pyelophlebitis, (2) the presence or absence of complications and (3) the type of drainage instituted. Nine (37.5 per cent) of the 24 patients in the authors series with single abscess of the liver and 19 (95 per cent) of the 20 patients with multiple abscesses died. The significance of the presence of complications in pyogenic hepatic abscess is demonstrated by the fact that in a collected series of 97 cases of pyogenic liver abscess with complications the mortality rate was 90.7 per cent in contrast to a mortality rate of 60.8 per cent in a similar series of 161 cases without complications. The mortality rate in the authors series was 92.9 per cent in 22 cases with complications and 36 per cent in 25 cases without complications. The importance of the type of therapy employed in pyogenic abscess of the liver is emphasized by the results obtained in the collected and in the authors series of cases. The total mortality rate in a collected series of 432 cases was 79.6 per cent. The total mortality rate in the authors series of 47 cases was 72.3 per cent. In a collected series of 102 cases not operated upon the mortality rate was 100 per cent while in a collected series of 151 cases in which operation was performed

the mortality rate was 50.9 per cent. These respective mortality rates in the authors' series were 100 per cent and 64.8 per cent. In 22 of the authors' cases in which the transabdominal approach was employed for the institution of drainage there were 16 deaths (72.7 per cent). The transpleural method of drainage was used in 9 cases with 6 deaths (66.6 per cent). In contrast to these high mortality rates is the 33.3 per cent mortality obtained in 6 cases in which the extraperitoneal approach was used for the institution of drainage.

The complications of pyogenic hepatic abscess are usually the result of rupture or direct extension of the abscess into one of the adjacent viscera, or, more rarely, of thrombosis and embolism. In a collected series of 453 cases, including those of the authors', pleuropulmonary complications occurred in 69, an incidence of 15.2 per cent. In the authors' series of 47 cases there was an associated pneumonia in 5 (10.6 per cent), lung abscess in 4 (8.5 per cent), and empyema in 2 (4.2 per cent). Peritonitis as a complication of pyogenic liver abscess is a result either of rupture of the abscess into the peritoneal cavity or of contamination by transperitoneal drainage of the abscess. In a collected series of 453 cases, including those of the authors, peritonitis was found in 33, an incidence of 7.2 per cent. Subphrenic abscess as a complication of liver abscess occurs relatively infrequently. In the 453 collected cases, including those of the authors, this complication was present in 18 (3.9 per cent). Liver abscess associated with generalized pyemia is likely to be complicated by abscesses of other organs. These complications were found to have occurred in 18 (3.9 per cent) of 406 collected cases.

The treatment of pyogenic hepatic abscess may be divided into. (1) prophylactic, and (2) surgical. Prophylaxis is applicable particularly to multiple hepatic abscesses which are preceded by appendicitis and pyelophlebitis, because once the development has proceeded to the stage of multiple abscess formation, surgical therapy offers only the slightest hope. It is essential that the appendiceal, ileocolic, superior mesenteric vessels, and even the portal veins be examined carefully during the operation in cases of appendicitis which give a history of chills occurring pre-operatively. Such an examination will permit the recognition of thrombosis in these vessels, the degree of its extension, and, by the application of proper surgical therapy, the prevention of the possible development of pyelophlebitis and multiple liver abscess. Once pyelophlebitis has occurred and is recognized either pre-operatively or post-operatively, the treatment is surgical. The treatment of solitary pyogenic hepatic abscess consists of incision and drainage. The type of drainage instituted is extremely important, as has been mentioned above. Only that type of drainage which completely avoids the slightest possibility of contamination of a virgin pleural or peritoneal surface should be employed. Depending upon the location, this can be readily accomplished by an extraperitoneal

anterior or posterior approach. If there is evidence of location of the abscess in the anterior or antero-inferior surface of the liver, the procedure advocated by Clairmont for drainage of subphrenic abscess can be utilized. If there is no evidence of localization of the abscess in the anterior abdominal region, the most rational method of drainage is by the retro-peritoneal approach previously described by Nather and Ochsner. This procedure consists, briefly, of making the skin incision directly over the twelfth rib and, after subperiosteally resecting this rib, making a transverse incision through its bed at the level of the spinous process of the first lumbar vertebra. After entrance through this incision into the retro-peritoneal space between the upper pole of the kidney and the inferior surface of the liver, mobilization of the parietal peritoneum from the under surface of the diaphragm can be readily effected. The results obtained in those cases in the authors' series in which this method of drainage was instituted clearly demonstrate its advantages.

Smith, M. K.: The Treatment of Acute Cholecystitis. *Am. J. Surg.*, 1938, 39, 192.

In recent years there has been a swing in surgical opinion toward earlier intervention in acute cholecystitis.

Five years ago, in an endeavor to clarify his ideas on the subject, the writer analyzed a series of 201 patients who came to operation for this condition at St. Luke's Hospital, New York. The mortality of the series was 7.3 per cent. Dividing them into two groups on the basis of whether the disease was still active or had subsided at the time of operation, the author found that the mortality of the former group was 9.3 per cent and of the latter 5.3 per cent. Recently these histories have been reviewed, private and unoperated cases, as well as some previously overlooked, included, and the series brought up to date, the total amounting to 436 cases over a seventeen-year period. Of these patients, 356 were operated upon with a mortality of 8.4 per cent. Of the 80 patients who were not operated upon 6.3 per cent died.

The incidence of empyema, gangrene, and perforation increases as the attacks are prolonged. In the St. Luke's Hospital series 27 per cent of these conditions developed in the first week, 31 per cent in the second week, and thereafter 53 per cent. To avoid these more serious pathological conditions is one of the purposes of early intervention.

There is a general impression that an attack of acute cholecystitis, if treated expectantly, will subside in the large majority of cases. Zininger, however, in observing 54 patients for periods of from twenty-four hours to twelve days, found that less than two-fifths showed improvement in their condition while the remainder showed no improvement or their condition became worse.

The nub of the question of when to operate is that of the risk of immediate surgery versus the risk of delay.

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Aside from the virulence of the organism and the resistance of the host, the prognosis in pyogenic hepatic abscess depends upon (1) the multiplicity of the lesions and whether there is an associated pyelophlebitis, (2) the presence or absence of complications and (3) the type of drainage instituted. Nine (37.5 per cent) of the 24 patients in the authors series with single abscess of the liver and 19 (95 per cent) of the 20 patients with multiple abscesses died. The significance of the presence of complications in pyogenic hepatic abscess is demonstrated by the fact that in a collected series of 97 cases of pyogenic liver abscess with complications the mortality rate was 90.7 per cent in contrast to a mortality rate of 60.8 per cent in a similar series of 161 cases without complications. The mortality rate in the authors series was 90.9 per cent in 22 cases with complications and 36 per cent in 25 cases without complications. The importance of the type of therapy employed in pyogenic abscess of the liver is emphasized by the results obtained in the collected and in the authors series of cases. The total mortality rate in a collected series of 432 cases was 79.6 per cent. The total mortality rate in the authors series of 47 cases was 72.3 per cent. In a collected series of 102 cases not operated upon the mortality rate was 100 per cent while in a collected series of 151 cases in which operation was performed

were not recognized as originating from gall-bladder disease. Only 1 patient with typical acute cholecystitis developed general peritonitis while under observation.

The paper is discussed by Cutler, Whipple, Douglas, and Grabam ELLA M. SALMONSEN

Glenn, F.: The Early Surgical Treatment of Acute Cholecystitis *Am J Surg*, 1938, 39 186

The author presents his experience with early surgical treatment of acute cholecystitis, an experience which now comprises 170 consecutive cases of patients in the early stages of the disease, treated at the New York Hospital in the past five years.

The clinical diagnosis of acute cholecystitis has been based upon a careful evaluation of the history given by the patient, and on the symptoms and the signs elicited by physical examination. In the typical case a fairly long history of recurring episodes of gall-stone colic frequently precedes the onset of the acute attack, there may, however, be no record of previous symptoms referable to the biliary tract. The pain is severe, is located in the right upper quadrant of the abdomen, and often radiates to the back or shoulder. Nausea and vomiting frequently accompany the onset of pain. The physical examination reveals marked tenderness in the right upper quadrant, associated sometimes with muscular rigidity in this area. The gall bladder may be palpable as a distended and tender mass. The patient looks ill, has a rapid pulse, some fever, and an elevated leucocyte count. Many patients whose attacks have lasted more than twenty-four hours show a mild degree of jaundice.

A considerable number of the 170 patients failed to present the characteristic manifestations of acute cholecystitis. In some there was no fever, in others the leucocyte count was normal, and in still others the symptoms were not acute and, therefore, gave little hint of the seriousness of the inflammatory process. In these atypical cases the final differential diagnosis was made on the basis of the findings at operation and the pathologist's report.

At the operating table the surgeon finds a red-dened, distended gall bladder with thick, edematous walls. In addition to one or more stones, the organ usually contains colorless bile or pus under pressure. On close inspection, areas of necrosis and gangrene of the wall may be noted, and in some cases a frank perforation will be found, with inflammatory reaction around the gall bladder and adhesions between it and the neighboring structures. Free perforation with general peritonitis also may occur. On gross pathological examination, an acutely inflamed viscus, with congested and edematous walls and areas of necrosis, is described, microscopically, the specimen shows polymorphonuclear infiltration with desquamation of the epithelium and necrosis of one or all layers of the gall bladder.

All of the 170 cases reported in this series fulfilled the above clinical and pathological criteria for a diagnosis of acute cholecystitis.

The author reviews the cases of acute cholecystitis by means of 3 charts.

CHART I — 170 CONSECUTIVE CASES OF ACUTE CHOLECYSTITIS TREATED SURGICALLY FROM SEPT 1, 1932, TO SEPT 1, 1937

Average age	46 years
Average duration of symptoms	2½ years
*Average temperature elevation on admission	43° C
Average white blood count on admission	12,086
Mortality rate for entire group	3.5 per cent
*Normal temperature	37° C

CHART II — 170 CASES OF ACUTE CHOLECYSTITIS

Diagnosis	No	Deaths	Mortality rate per cent	Average white blood count	Average age
Acute cholecystitis	117	3	2.56	11,587	43
Acute cholecystitis with gangrene	38	1	2.6	12,883	47
Acute cholecystitis with gangrene and perforation	15	2	13.3	15,003	48

It is interesting to note from Chart II that the leucocyte count and the mortality rate increase with the extension of the inflammation, that after perforation the mortality is very high; and that the majority of patients with perforation are in the older age group (fifty or more years of age).

CHART III — DURATION OF DISEASE AND MORTALITY RATE

Duration	No	Deaths	Per cent mortality
Less than 1 month (12 with initial attacks)	41	0	0
One to six months	17	0	0
Six months to one year	11	0	0
One to five years	56	2	3.5
Five to ten years	20	2	10
Ten to twenty years	20	2	10
Twenty years and more	5	0	0

Age Incidence and Mortality Rate

	Cases	Per cent mortality
Patient under fifty years of age	116	1.7
Patient over fifty years of age	54	7.4

From Chart III it is apparent that the longer the disease is allowed to persist without surgical intervention, the graver the risk of operation when an acute attack occurs. In the cases of 69 patients with symptoms for less than one year, no post-operative death occurred, in 101 patients with manifestations of gall-bladder disease for longer than one year there were 6 deaths. Age, also, is shown to have a bearing on the outcome of the operation.

Heuer, Graham, McKenty and Mentzer advocate early operation and show a lower mortality rate in these cases.

Miller, stimulated by the occurrence of perforation in 2 cases in which operation was being delayed, studied the material at the Massachusetts General Hospital, Boston, and found that in the fatal cases the average duration from the onset of the attack to operation was fifteen days while in those with recovery the average time was eight days. He felt that the expectant plan of treatment should be promptly abandoned if the patient was not definitely improving.

Branch and Zollinger reviewed the material at the Peter Bent Brigham Hospital, Boston, in an article which they designated as a study of conservative treatment. Thirty-four of their series of 229 operative cases were submitted to immediate surgery with a mortality of 14.4 per cent as opposed to the general mortality of 10.4 per cent.

Pennoyer, in a recent paper read before the New York Surgical Society, presented a study of 300 cases from the Roosevelt Hospital, New York, where the surgeons prefer to allow the attack to subside before operating. In order to leave no doubt as to the acuteness of the attack, he included only patients who had had a temperature of at least 101°F and a leucocytosis of 12,000 or more. The general mortality was 10 per cent. Among the 59 patients operated on as emergencies, the mortality was 25 per cent and represented half the fatalities in the whole series.

It is but fair to emphasize that in both Branch and Zollinger's and in Pennoyer's series immediate operation was performed in only the seemingly urgent cases and these were not necessarily early cases reckoning from the onset of the attack.

Graham of Toronto champions a conservative attitude. It is his practice to withhold operation until the temperature is normal unless the condition is becoming worse. He reported a mortality of 5.8 per cent in a series of 68 operative cases.

In the St. Luke's Hospital series, 127 patients were operated upon in the first twenty-four hours after admission with a mortality of 13 per cent. In the remainder, the death rate was 6 per cent. The author concludes that patients with fulminating conditions contribute to a high early mortality and those depleted by long illness and advanced pathological changes to a rising late mortality.

After subsidence of the clinical symptoms there is less risk from intervention than when it is carried out during the acute phase of the condition. Among 164 patients operated on while still febrile, the mortality was 12 per cent as opposed to 3.2 per cent among 102 who were afebrile.

Discussion. It seems plain from the foregoing that the question of immediate versus delayed intervention cannot be settled as yet by the statistical method. In the meantime it is the opinion of the writer that no rule can be laid down and that each case must be judged on its own merits.

There always will be, of course, urgent cases which will require operation at once and contribute disproportionately to the mortality. However, if a patient is seen in the early stage of the disease and is a good risk, particularly if his symptoms are not severe, a prompt cholecystectomy should not be attended with high mortality, and it forestalls the dangers of later complications.

In the case of the average patient who is admitted with definite but not urgent symptoms, particularly if he is middle-aged or older, it is better to wait if possible for subsidence of the temperature. If however improvement is not reasonably prompt, one should intervene without undue delay unless the individual is a poor risk.

CAVE summarized his opinion in a paper before the American College of Surgeons in October, 1937, as follows: "In the majority of these cases it is far better that these patients be observed for twenty-four or thirty-six hours or even longer to see whether or not the temperature, pulse rate and blood count will diminish, indicating a subsidence of the inflammatory process. When the temperature remains elevated after thirty-six to forty-eight hours, the pulse rapid and the general appearance is not improving, we do a cholecystectomy or cholecystostomy."

CONCLUSIONS

The management of acute cholecystitis cannot be laid down by rule but calls for individual judgment.

In general, patients whose symptoms have subsided are better risks.

One should be prepared to intervene promptly if progress is unsatisfactory.

Caution is indicated particularly in older patients who furnish a large proportion of the fatalities.

NORMAN C. BULLOCK, M.D.

Pennoyer, G. P. Results of Conservative Treatment of Acute Cholecystitis. *Ann Surg* 1938, 107: 543.

The author has made an analytical study of 300 consecutive cases of clinically acute cholecystitis treated in the Roosevelt Hospital, New York City, since 1917. There were 30 deaths, or a mortality of 10 per cent.

It has been the policy at this hospital never to operate immediately upon patients suffering from acute cholecystitis but to wait until the acute symptoms have subsided. Fifty-nine of the 300 patients or about 20 per cent were operated upon within twelve hours after admission; 32 or over one-half of them had had incorrect diagnoses. Fifteen or 25 per cent of this group died, which accounts for half of the 30 deaths in the entire series. Of the 241 patients so treated, 22 died, a mortality of 9 per cent. Twenty per cent of the entire series of 300 patients showed at least some gangrene of the gall bladder wall and half of these had rupture with resultant local peritonitis. There were only 7 cases of general peritonitis and of these 4 were so atypical that they

were not recognized as originating from gall-bladder disease. Only 1 patient with typical acute cholecystitis developed general peritonitis while under observation.

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ELLA M. SALMONSEN

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A considerable number of the 170 patients failed to present the characteristic manifestations of acute cholecystitis. In some there was no fever, in others the leucocyte count was normal, and in still others the symptoms were not acute and, therefore, gave little hint of the seriousness of the inflammatory process. In these atypical cases the final differential diagnosis was made on the basis of the findings at operation and the pathologist's report.

At the operating table the surgeon finds a reddened, distended gall bladder with thick, edematous walls. In addition to one or more stones, the organ usually contains colorless bile or pus under pressure. On close inspection, areas of necrosis and gangrene of the wall may be noted, and in some cases a frank perforation will be found, with inflammatory reaction around the gall bladder and adhesions between it and the neighboring structures. Free perforation with general peritonitis also may occur. On gross pathological examination, an acutely inflamed viscus, with congested and edematous walls and areas of necrosis, is described, microscopically, the specimen shows polymorphonuclear infiltration with desquamation of the epithelium and necrosis of one or all layers of the gall bladder.

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In summarizing the information given in the charts, it may be said that two factors besides the extent of the inflammatory process, have a definite bearing on the outcome of operation in acute cholecystitis. The first of these is the duration of symptoms referable to the gall bladder before the onset of the acute attack for which surgical treatment is undertaken, the second factor is the age of the patient at the time of operation.

The mortality was not high in cases of uncomplicated, acute inflammation but gangrene and gangrene perforation added seriously to the danger of a fatal outcome.

As to the question of complications after operation there is nothing to indicate that these are influenced by the time at which operation is performed. Much more significant in this respect is the age of the patient and his general condition before operation. The author believes that if time is taken to counteract such conditions as dehydration and cardiac decompensation and the operation is planned so that it places little additional burden on a sick patient, the incidence of complications after operation for cholecystitis in the acute stage is no higher than after cholecystectomy in chronic cholecystitis.

NORMAN C BULLOCK M.D.

Whipple A. O. The Surgical Therapy of Hyperinsulinism. *J. internat. de chir.* 1938 3 237

Hypoglycemia may be caused by disturbances of the physiology of the liver, the anterior lobe of the hypophysis, the adrenal cortex, the thyroid, the sympathetic nervous system and the hypothalamus and may also occur as a result of over active islet tissue in the pancreas. The blood sugar level is maintained as the result of an interplay of these same organs.

The characteristic syndrome of this condition consists of attacks of nervous or gastro intestinal disturbances coming on in the fasting state associated with a hypoglycemia with readings below 50 mgm per cent which is relieved immediately by the ingestion of glucose. Unless this triad is present the patient should not be considered for operative therapy.

The nervous manifestations in these attacks may be grouped under three main heads: (1) those related to disturbances of the sympathetic nervous system appearing as nausea, sweating, pallor, flushing, chilliness and syncope; (2) those related to the central nervous system manifested by restlessness, tonic or clonic muscle spasms, opisthotonos and convulsions; and (3) those coming under the heading of psychic disturbances such as apprehensiveness, confusion, disorientation, mania, unconsciousness, and coma.

In none of the proved islet tumor cases was the fasting blood sugar found to be above 60 mgm per cent.

The gross and microscopic picture of these tumors reveals: (1) a diffuse hypertrophy or hyperplasia of the islet; (2) an adenoma of the islet tissue; and

(3) carcinoma of the islet tissue. The most severe hypoglycemia was found in patients with carcinoma of the islet tissue. When more than one adenoma was found a different arrangement could be seen in the two or more adenomas with varying amounts of degeneration.

There are many patients with mild hypoglycemia due to over active islet tissue who respond to conservative therapy. The conservative measures may be divided into dietary and gland therapy. A diet which is low in carbohydrates and high in fat has been advised as well as one which is high in protein.

Certain measures and technique for the surgery of islet tumors have been suggested: intravenous pre-operative administration of 1000 ccm of 5 per cent glucose in normal saline solution and transfusion if necessary; spinal anesthesia but more often drop ether anesthesia; the curved transverse incision through both recti followed by the division of the gastrosplenic omentum which provides a free inspection of the entire pancreas. Islet tumors are most frequently found in the tail or body of the pancreas and if not easily found there the body should be mobilized and palpated. If they are not found in the tail or body of the pancreas the duodenum should be mobilized and the head of the pancreas palpated. If one adenoma is found careful search should be made for more; drainage is not necessary unless there is leakage of the pancreatic duct. If no tumor is found after a very complete exploration the results in cases in which the body and tail have been resected are much better than those in cases in which a small portion of the tail has been removed. It is advisable to remove the spleen as well in order to control hemorrhage. The head of the pancreas should be drained after ligation of the pancreatic duct. The use of fine silk has been found satisfactory and will prevent the digestion of ligatures which occurs when catgut is used in pancreatic tissue.

The finding and removal of all islet tumor tissue give brilliant and lasting cures of the hypoglycemic state.

The author states that when an islet tumor was found and a partial pancreatectomy was done poor results were obtained as a rule because of an overlooked adenoma or hyperplastic islet tissue.

There was a total of 56 cases in this series which were operated upon with disclosure of a tumor. There were 43 patients with islet cell adenoma and 13 with islet cell carcinoma. Of these 5 died post-operatively and 5 died of other causes. 1 showed no improvement after one year and 4 gave insufficient data. 41 had relief of the hypoglycemia. Thirty-one patients had been followed for more than one year and 7 were followed for a period of more than five years.

Of the patients in whom resection was performed and no tumor was found, 4 died postoperatively, 10 had complete relief of symptoms, 4 showed improvement in their condition, 13 showed no improvement and 3 gave insufficient data. Fifteen addi-

tional cases of hypoglycemia with islet-cell tumor, which came to autopsy, are presented from the literature. Seven cases of hypoglycemia in which no tumor was found at autopsy are also presented. The author records the total number of operated cases in the literature, and reports the results obtained in these cases up to January, 1938.

RICHARD J. BENNETT, JR., M.D.

Ransom, H. K.: Carcinoma of the Pancreas and Extrahepatic Ducts. *Am J Surg*, 1938, 39: 264.

A group of 109 cases of carcinoma of the pancreas and extrahepatic bile ducts, verified by operation or autopsy, has been reviewed. The disease occurred approximately twice as frequently in males as in females, and the average age of the patients was fifty-six and nine-tenths years. Weight loss was the most common symptom, it was usually extreme, averaging 13.8 kgm., and it occurred rapidly. Jaundice was the most common chief complaint and abdominal pain the most common initial symptom, the average duration of the symptoms was five and five-tenths months, jaundice was the most common physical sign and was present in over three-fourths of the cases.

Courvoisier's law was of relatively little value in making a correct diagnosis prior to operation, but it was of considerable value to the surgeon at the time of laparotomy, as it indicated the type of duct obstruction which was present. The operative findings proved the law to be accurate in over 80 per cent of the cases. Laboratory studies were of practically no

value in diagnosis while roentgenological studies were positive or suggestive in one-fourth of the cases. In the non-icteric patients the difficulties in diagnosis were greater than in the icteric group. In the former cases the condition was most often confused with carcinoma of the stomach or colon. Evidence of antecedent infection of the biliary tract, as indicated by contraction of the gall bladder or thickening of its wall, was noted in approximately one-eighth of the operative cases, while calculi were present in the gall bladder in one-sixth.

Cholecystogastrostomy was regarded as the best palliative operation. The operative mortality for this procedure was 29.17 per cent. In 10 cases, according to the diagnoses made at the time of operation, the ratio of cases of carcinoma of the pancreas to that of the bile ducts was 2 to 1. Autopsy examination of these same cases proved that the ratio was 1 to 2. In 3 cases of carcinoma of the ampulla of Vater, transduodenal resection was performed, with 1 postoperative death and 2 recoveries. Hemorrhage was the most common cause of death following operation. The average duration of life following palliative biliary gastro-intestinal anastomosis was seven and two-tenths months in a group of 21 patients traced. Post-mortem examination showed the most common site of metastases to be the regional lymph nodes, while metastases to the liver and lungs occurred next in frequency. In the group of 30 cases examined post mortem, there were 4 instances of multiple malignancy.

JOSEPH K. NARAT, M.D.

GYNECOLOGY

UTERUS

Pickhan A. Certain Viewpoints on the Irradiation Therapy of Carcinoma of the Cervix (Gesichtspunkte zur Strahlenbehandlung des Gebärmutterhalscarcinoms) *Strahlentherapie* 1937 60 503

The author discusses the evolution of the laws of irradiation therapy which have as their goal the local destruction of malignant tumors and the stimulation of the histocytic defense mechanism or at least they aim not to damage the function of the defense mechanism. In that portion of this work which deals with the physics of irradiation the modern problem of dosage is discussed especially the problem of radium dosage in roentgen units. Four methods are available (1) the ionization method (2) the mathematical method (3) the photographic method and (4) the biological method. The author has used the mathematical method for testing the dosage of his apparatus. An illustration shows the curves of isodoses of a single radium applicator during simultaneous radium implantation in the cervix and vagina. The sharp drop in dosage at a distance from the applicator is clearly shown which is definite evidence supporting the use of radium for local irradiation and the addition of x rays for irradiation of the periphery. All four groups of cervical carcinoma are treated radiologically by the author. In large exophytic tumors he succeeds (with one or two preliminary radium irradiations with 40 mgm. of radium over a period of thirty hours) in causing the tumor to regress sufficiently in eight or ten days to permit further intracervical therapy. The average dose is from 7 000 to 8 000 mgmh. (corresponding to from 25 000 to 26 000 roentgens). Radium needing formerly employed has been discontinued since the author observed numerous thromboses. In Groups I and II deep x ray irradiation is added as a prophylaxis. Large fields measuring 30 by 24 cm. are used. The skin target distance is 42 cm. half protection layer 1.3 mm. copper. 27 roentgens are given per minute making an average dose of 3 500 roentgens on the surface (abdomen sacrum and vulva). Lateral fields are not used because of the danger of bone damage. In Group III x ray irradiation surpasses the value of radium irradiation. In Group IV radium is not used at all. In Groups III and IV the total period of x ray irradiation lasts two months since single surface doses amount to only 120 or 140 roentgens. Attention is called to the dangers of radium irradiation in the presence of sloughing infected tumors. Postoperative irradiation is used in all cases treated surgically on the gynecological service. Preoperative irradiation is also used when the operability or non operability of the individual case is uncertain. The results of this method are discussed in another chapter.

With the help of the Tumor Aid Organization accurate statistics are being gathered by the National Health Bureau (Pohlen). Detailed description is given of the methods employed in gathering these statistics. Because of the strict organization no case can become lost. The author quotes figures which were derived according to the regulation covering deaths and set up according to scientific and statistical points of view. A total of 1 536 cases were gathered. One hundred and twenty nine patients died within six months after beginning treatment for carcinoma. 13 died of other causes. This gives a mortality of 9.5 per cent for the first six months. Diagrams show the order of deaths of the symptom free cases. From these diagrams it is possible to determine the percentage of cures following treatment for each year. One third of all the patients survived without recurrence for a period of ten years. Patients treated exclusively by irradiation therapy presented better results than those treated by combined methods. In Group I, 56 per cent were free from recurrence in the tenth year. In Group II, 25 per cent and in group III, 15 per cent. These figures hold if the patient survived the first six months without recurrence. Calculations of the direct cures show Group I, 42 per cent. Group II, 21.5 per cent and Group III, 6.9 per cent. Many important figures cannot be included in this abstract. They can be obtained by consulting the curves in the original article.

(Klancher) HAROLD C. MACK M.D.

MISCELLANEOUS

Rydberg E. Some Cases of Metropathia Hemorrhagica and Secondary Amenorrhea Treated with Gonadotropic Hormone (Einige Fälle von Metropathia haemorrhagica und sekundärer Amenorrhoe behandelt mit gonadotropem Hormon). *Acta obst. et gynec. Scand.* 1938 18 1.

Four cases of secondary amenorrhea and a case of metropathia hemorrhagica were treated with large doses of physex, a high potentiated placental or chorionic type of gonadotropic hormone secreted from the urine of pregnant women. The author was led to attempt the treatment of the cases of amenorrhea by the consideration of the success of the placental hormone which apparently acts as a non-specific stimulator of a sub potent sexual organism in cases of cryptorchidism in the male. Although the time is too brief and the cases too few to allow of any considerable conclusions, apparently normal menstrual bleeding and luteinization of the curetted endometrial specimen appeared in all 4 of the cases. The patients were all young women and from 4 000 mouse units and upward of the hormone had been administered in each case. The author thinks that as an agent which will stimulate the torpid sexual

organs is most keenly needed at the present time, and as the placental hormone seems to have the desired effect on the ovary, this hormone should be accepted for the treatment of amenorrhea.

In the 2 cases of hemorrhagic metropathia, one of the juvenile, and the other of the preclimacteric, type, curettement disclosed the usual histological picture of glandular, cystic hyperplasia. In the juvenile case, 700 mouse units and in the preclimacteric, 7,000 mouse units, were administered intramuscularly, and a few days later diagnostic curettement showed the endometrium to be in the stage of secretion (luteinization). Of course the effects of the hormone therapy in these 2 cases were perhaps temporary, but the effect, immediately on the ovary and secondarily on the endometrium, was as good as demonstrated.

(This "physex" must not be confused with the old "physex," which was prepared by the same manufacturer, and also from the urine of pregnant women.)

The author regards 1 mouse unit of this new highly potentiated "physex" as equivalent, in dosage effect, to 8 rat units of "prolan" and to 2 rat units of "Antuitrin-S."

In the discussion following Rydberg's report, WESTMAN maintained that treatment with the follicular hormone of the ovary (estrin) is more than a mere substitution therapy, and that he had seen estrin have a favorable effect on the course of menstruation, apparently by stimulation of the hypophysis.

In answer to Westman's assertions, RYDBERG admitted the possibility that estrin could influence the hypophysis and merely affirmed that although menstrual-like bleeding may be produced with the ovarian hormone, histological examination of the endometrium had always in his hands shown it to be in the proliferative stage.

JOHN W. BRENNAN, M.D.

Donald, H. R.: *The Female Climacteric and the Menopause*. *Brit M J*, 1938, 1: 727.

The author emphasizes the difference between "menopause" and "climacteric." The former term should be restricted to its literal meaning of the cessation of the menses. While the cause for the permanent amenorrhea is not known, it is accompanied by two principal endocrine changes. There is a relative decrease in the circulating estrogens, which are almost or completely absent from the blood stream in at least 50 per cent of women three years after cessation of the menses. The second change is an increased content of prolactin A in both the pituitary gland and the urine.

The climacteric refers to an era during which there is a summation of numerous independent factors which result in a chronic state of potential nervous disharmony, which need bear no relation to the menopause, but which may mature or be activated many years later. The changes lack uniformity and vary greatly in severity. The most

distinctive mental change is a progressive introversion of the mind, with depression, inertia, and insomnia. Other symptoms are headache, dizziness, various rheumatic affections, and swelling of the extremities or face.

From the clinical viewpoint there is little doubt that involuntary changes affect glands other than the ovaries. There may be mild degrees of myxedema or hyperthyroidism, and diabetes. Several cases bearing a striking resemblance to Addison's disease have been observed. Thus it will be seen that the climacteric differs from the menopause in being a general rather than a local disturbance, and in being a chronic immeasurable clinical state rather than a clear-cut observable symptom.

The menopause and the climacteric may not always possess a close temporal relation. The onset, severity, and chronicity of the climacteric depend upon (1) the fundamental constitution of the individual, and (2) the individual degree of endocrine change which occurs at the climacteric. Such changes are extremely variable, however, moreover, the severity of climacteric symptoms need not be proportionate to the degree of endocrine change.

In from 80 to 90 per cent of women the menopause is closely related to the onset of climacteric symptoms, but the latter may precede or follow the establishment of amenorrhea by a number of years. A number of cases illustrating the delayed onset of climacteric symptoms are presented.

The author believes that x-rays, gonadotropic preparations, insulin, thyroid, testosterone, luteal hormone, and estrin all have a place in the treatment of climacteric symptoms. It is rarely necessary to give more than 1 mgm of estradiol two or three times a week to relieve the symptoms of the natural climacteric due to a lack of estrin.

DANIEL G. MORTON, M.D.

Durupt, A.: *The Dosage of Folliculin in Women; Criticism of the Results; and Study of a New Test* (Le dosage de la folliculine chez la femme, critique des résultats et étude d'un nouveau test). *Gynéc et obst*, 1938, 37: 183.

The value of the dosage of follicular hormone in women has not been adequately demonstrated. After a number of years the clinicians realize that the activity of the ovarian secretions has been a delusion.

Errors arise in the interpretation of published results because of the difference in standardization of the hormone, titration variation which occurs with different rats and in different rat races, difference in alimentation, and the presence of Vitamin A. The technique of administration, the cycle of injection, and, lastly, the vehicle or solvent change completely the sensitivity of the animal.

The author has taken into consideration all of these factors of error and has attempted to eliminate them in his investigative work. He believes that rat units are not exact and stable, whereas the international unit, equivalent to 0.17 or one-tenth of a

milhonth gram is well defined and therefore more satisfactory. The international unit is defined as the smallest dose of the active product capable of producing the same biological reaction as 0.17 of the crystallized folliculin.

The so called Doisy and Curtis method of opening of the immature mouse vagina is favored by the author and he has used this method for studying the dosage of folliculin.

Results of the effect of varying doses of aqueous solutions of crystallized folliculin in daily injections of equal volume but decreasing concentration over a period of three days with reference to the opening of the vagina in 7 mice are presented in tabulated form.

A second table is presented showing the results of only one injection of the same solution but with oil as the vehicle instead of water. The results show that the oil solution is more feeble than the water solution administered over four days in fractionated doses.

From his study the author concludes that the test of Doisy and Curtis is equally as sensitive in the immature mouse as the test of Allen and Doisy on the castrated mouse and 5 times more sensitive than the latter if carried out on castrated rats. The vagina opens after 3 daily injections of 0.5 c cm. of aqueous solution containing 0.174 of folliculin, or after one injection of 0.25 c cm. of oily solution containing 0.257 of folliculin. The test is established by the simple opening of the vagina. The test of Allen and Doisy (cellular keratinization) on the immature mouse is much less sensitive and should not be used. The intensity of the test is proportionate to the dosage used in the aqueous solution but not in the oil solution.

GEORGE C. FRIDLAND M.D.

Frankl O. The Frequency of Genital Carcinoma in the Young (*Die Häufigkeit des Genitalcarcinoms bei Jugendlichen*). *Zentralbl. f. Gynäk.* 1938 p. 35.

After a survey of the views of other authors expressed in the literature up to the present the author presents his own statistical material concerning the incidence of genital carcinoma in the young. His figures are of importance especially because they represent entirely his own work and judgment. Only those cases are included in which histological

proof of carcinoma could be shown. For statistical contrast the years from 1908 to 1918 and from 1926 to 1937 were chosen. The total number of cases for the first decade was 1,035, for the second decade 1,409. Metastatic neoplasms and granulosa-cell tumors were excluded. The classification of carcinoma of the various portions of the genital tract (cervix, vagina, vulva, ovaries, tubes) was practically the same in both periods.

The absolute increase in cases of carcinoma in the last period was a result of an increase in the total number of patients. No higher incidence of cervical carcinoma was seen among young women. Between the ages of twenty and thirty, a more favorable incidence was noted in the years from 1926 to 1937, namely 3.2 per cent, as opposed to 3.5 per cent in the years from 1908 to 1918, the incidence below the age of twenty-five years remained approximately the same, namely 0.5 per cent. A slight though definite increase was noted in the frequency of corpus carcinoma in women under forty years of age. While in the years from 1908 to 1918 not 1 of the 75 women with carcinoma of the corpus was under forty years of age, 8 of 127 women observed in the years from 1926 to 1937 had corpus carcinoma at an age less than forty years. In contrast only 16.5 per cent of the women of the second period became affected between the ages of forty-one and fifty years. In the first period 26.6 per cent of the women developed carcinoma during these years. The numerical distribution of women affected between the ages of fifty-one and sixty was the same in both periods. A very slight increase of ovarian carcinoma was noted during the second period among very young women. It would be incorrect, however, to state that there was an increased incidence of carcinoma among younger women. There was no increase among the younger women of the last decade of carcinoma of the tubes, vagina, and vulva. Below the age of twenty-five there was an increase from 0.6 to 0.9 per cent for all types of genital carcinoma. However, since the percentage in the third decade was still less than one, this slight increase is of no significance; the difference still lies within the possibilities of error of any statistical method. No conclusion that carcinoma is on the increase among young women was therefore justified.

(G. SCHAEFER) HAROLD C. NICK M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Samuels, J.: An Accurate Method of Determining Ovulation and Pregnancy (Eine exakte Methode zur Ovulations- und Schwangerschaftsbestimmung) *Jap J Obst & Gynec*, 1937, 20 579

In a patient who had suffered with primary amenorrhea and had been cured by the short-wave method, it was found that one day before a menstruation the system was completely balanced in the endocrine electrodiagram with values around 180, seven days after menstruation the endocrine system was also in balance, but all the values were around a normal of 150. This led to the thought of determination of the daily reduction figures of the oxyhemoglobin in a normal female before and after menstruation. It was found that these values showed typical variations during the menstrual cycle, whereby the rise and fall of the gaseous metabolism could be determined in a simple manner as an index of the hormone content before, during, and after menstruation and during ovulations. Such a curve is called a cyclogram. This also has importance in the problems of conception and abstinence. The cyclogram shows how extremely accurately these reduction values indicate the amount of hormone content—the amount of activators and regulators of the gas metabolism in the blood.

The technique was as follows: A spectroscope was clamped to an interdigital fold, preferably between the thumb and index finger. This showed two dark bands in the yellow and green which indicated the absorption of oxyhemoglobin. After some time the bands became indistinct and hazy, and finally disappeared, they were then replaced by a gray, homogeneous band, which indicated the moment of completion of the reduction. After from five to seven seconds, two new bands appeared, close together, with a less broad yellowish-green interval. The entire picture was more hazy and displaced more to the left than the oxyhemoglobin bands, the absorption bands of the methemoglobin being seen. The methemoglobin bands then disappeared in from ten to forty seconds. The picture then repeated itself but at a more rapid rate.

With a simple instrument, the cycloscope, the time of reduction was determined. In normal men and women after the climacterium, in whom the endocrine system is not balanced, the examination took about one hundred and forty-five seconds. In sexually mature women the daily reduction figures varied. In a woman at the height of sexual maturity, such a daily cyclogram varied from the normal three times a month, most markedly during menstruation, the other less marked and shorter variations indicated the times of ovulation. Women between twenty-five and forty years of age ovulated twice a

month, most nulliparas ovulated three times a month. The pre-ovular rise of the hormone content is a complicated process, associated with the preparation for ovulation and the increasing production of folliculin, gonadotropic hormone, and other hormones. The cyclogram is the expression of a similarly complicated process, which consists of the sudden escape of the contents of the graafian follicle, the partial interruption of the formation of folliculin and prolactin, and the production of luteinizing hormone. During two laparotomies it was possible to demonstrate that the two ovaries ovulated at different times, which indicated that the women who usually show ovulation on the ninth, tenth, eleventh, or twelfth and on the seventeenth or eighteenth day of the menstrual cycle have 2 or 3 ovulations during the cycle, also that the ova develop and mature according to certain laws, and that the graafian follicles rupture independently of copulation, even though there is a certain time relationship between ovulation and menstruation.

Heretofore it was impossible to determine accurately the time of ovulation. It was always believed that a single ovum was liberated during each cycle. With the method described it has been shown that at least two ova, one from each ovary, are liberated during a cycle. As a result of the cycloscopic examination the mathematical computations of Ogino and Knaus have been verified and it is now possible to estimate the exact day of ovulation.

The cyclogram shows the following phases: (1) the first pre-ovular climax, (2) the first ovulation, (3) the second pre-ovular climax, and (4) the premenstrual climax. The highest and lowest figures and the duration of the phases vary in different women and also in the same woman during different months. There is a difference between women with a twenty-six-to-twenty-eight-day cycle and those with a thirty-to-thirty-one-day cycle in the time and course of the menstruation. In young and sometimes in older women all the figures are higher. In younger girls, who ovulate three times, the ovulation and the second rise of the curve may occur without a pause on the same day. Exceptionally, the ovulation may last longer than usual.

The most favorable time for conception lies within the days of the falling curve of ovulation. One day later conception is uncertain and another day later it is almost impossible, as an ovum is impregnable only for two days. The problem of conception is thus solved simply.

The problem of abstinence is not so easily solved, because investigators have varying views as to the duration of viability of spermatozoa in the female genital tract. It may be said, however, that a woman is sterile after the last ovulation up to the time of menstruation. She is probably also sterile during menstruation and from three to four days

thereafter, during the rest of the cycle conception is possible. Hence the time of absolute sterility is longer for a woman with a thirty one day cycle than for one with a twenty six or twenty eight-day cycle in young girls with 3 ovulations it is shorter. It has also been shown that spermatozoa travel from 2 to 3 mm per minute and from 12 to 18 cm per hour hence they may reach the ampulla in about one and one half hours and impregnate the ovum.

It is possible to diagnose pregnancy easily by the constancy of the daily reduction figures. In recent pregnancies of healthy women in endocrine balance there are constant daily reduction figures of from 155 to 165. From the second to the seventh or eighth month the figure is constant at about 160 and at the end of pregnancy it reaches 155. Shortly before labor the figures rise to about 165, with variations just before labor. It is assumed that the fall and the variations just before labor are associated with the changed hormone production in the hypophysis, placenta, decidua and corpus luteum verum. In this way it is easy to differentiate between fibromyoma, grossesse nerveuse, and pregnancy also between ectopic pregnancy and mole.

The diagnosis of pregnancy can also be made more quickly by observation of changes in the cycle than with the Aschheim Zondek reaction. With this method, pregnancy may be suspected on the evening of the third day after impregnation by the unusual climax of the curve. It may be assumed as probable on the fourth day by the unusual fall and as very probable one day later. For the sake of caution the curves may be studied two or three days longer. If they remain constantly low, there is no doubt about the pregnancy being early. In a woman with a thirty-one day cycle who was impregnated during the first ovulation the diagnosis could be made on the eighteenth or nineteenth day with absolute certainty seven or eight days after impregnation and about twelve days before the following menstruation and in a woman with a twenty-eight day cycle who was impregnated during the first ovulation it was made nine or ten days before the expected menstruation. If impregnation occurs during the second ovulation the diagnosis is certain six or seven days later. In every case pregnancy can be diagnosed before the absence of menstruation. Constant figures of from 155 to 170 on four or five successive days point definitely to pregnancy both in the intermenstrual period and in the absence of menstruation.

LOUIS NEUWEIT M D

Kehrer E. Hyperemesis Gravidarum (Hyperemesis gravidarum). *Zeitschr f Geburtsh u Gynaek* 1933, 116 333

This article surveys the present status of scientific research on hyperemesis gravidarum. Clinically this condition is divided into two types, the severe toxic and the mild neurotic. The author gives an interesting example of a case of psychogenic hyperemesis. Detailed description is given of the treatment with hormones and vitamins. Other modern

therapeutic measures are also discussed such as liver therapy and serum administration.

In the consideration of therapeutic abortion, the author joins with Winter in the view that interruption should be considered only in the very severe, pernicious types of cases complicated by other diseases especially cerebral. This viewpoint should be generally adopted. In such instances intervention must be timely since a fatal outcome for the woman is possible. In judging the severity of such cases the presence of hypochloremia and azotemia are of great importance. Less important nowadays is the finding of acetoneuria. The determination of the blood ketone levels on the other hand is of great importance. French authors stress the importance of the Maillard coefficient. The presence of icterus and subicterus should not be minimized. On the whole such severe cases are quite rare, they may however, occur and in such event interruption should not be delayed especially if energetic conservative treatment does not immediately bring improvement.

(HUSSEY) HAROLD C. MACK M D

LABOR AND ITS COMPLICATIONS

Apajatahti A. Can the Time of the Rupture of the Membranes Depend upon the Histological Structure of the Fetal Membranes? (*Kann der Zeitpunkt des Bruchens der vom histologischen Bau der Fruchthäute abhngig sein?*) *Acta obst et gynec Scand* 1933 18 57

By means of various staining methods the fetal membranes of 40 women in whom the pelvis, the amount of amniotic fluid and the position of the fetus were called nothing pathological were studied. The women were divided into 4 groups on the following bases: (1) premature rupture, (2) early rupture, (3) full term rupture and (4) retarded rupture.

The histological studies of the fetal membranes showed that the amnion and chorion were distinctly separated tissue layers. The connective tissue layer lying directly under the amniotic epithelium constituted the firmest portion of the membranes and their resistance seemed to depend mainly upon the firmness of the amnion. The chorion was a much looser retiform tissue consisting of connective tissue fibers, of which the demarcation from the decidua was indistinct. No elastic or muscle fibers were seen. A weakening of the color receptivity of the tissues of the amnion and chorion from the edge of the placenta to the site of rupture of the membranes seemed to indicate a reduction in vitality toward the site of rupture. Taking into consideration the fact that the membranes became thinner in the same direction it seemed plausible that the resistance of the membranes diminished toward the site of rupture.

In the case with retarded rupture of the membranes the amnion was relatively thick and particularly in the subepithelial connective tissue layer the fibers were especially closely crowded against

one another and wave-shaped. The nuclei were well preserved. No noteworthy degeneration was noticeable, nor could any inflammatory symptoms be demonstrated.

In the cases with premature rupture of the membranes, the amnion was generally distinctly thinner. It was often edematous, the connective-tissue fibers were swollen, and lay somewhat separated. Around the nuclei there were vacuoles, and the cells had undergone degeneration. Similar changes were also seen in the chorion and the decidua, and there were also hyaline degeneration and necrotic areas, and numerous pyknic cells. The decidua revealed isolated granulocytes, but these were not attributable to an inflammation, but rather to the penetration of granulocytes into necrotic tissue.

This study seemed to indicate that the rupture of the membranes depends upon their histological structure and, particularly, upon the thickness of the amnion. The thinner the membranes, especially the amnion, and the more pronounced the degenerative changes, the easier and the sooner does the rupture of the membranes occur. A bacterial inflammation, resulting in direct adhesion of the membranes to the deeper layers of the decidua, could not be demonstrated.

LOUIS NEUWELT, M D

PUERPERIUM AND ITS COMPLICATIONS

King, R. C.: Gynoplastic Repair Following Delivery. *Am J Obst & Gynec*, 1938, 35: 497

The vaginal tract should be examined after every delivery, if there is no contra-indication from the standpoint of asepsis or the general condition of the patient. New lacerations and injuries should be cared for at that time.

In selected cases, and under favorable conditions, repair of old cervical and perineal injuries can be carried out with little difficulty immediately after delivery. The immediate and late results are usually satisfactory.

The immediate operation offers advantages from an economic and psychological viewpoint, while the intermediate operation has the additional disadvantage of disturbing tissues that have already started to heal.

Extensive repair of cystocele, rectocele, and enterocele, as well as of the cervix and perineum, is an operative procedure requiring more time and precision than is advisable after delivery. Such operations should be delayed until the patient has fully recovered from her delivery and the tissues have undergone complete involution.

Repair of the cervix and perineum do not prevent procidentia and uterine displacements. These conditions can be corrected only by restoration of the fascial attachments in their normal relationship. Surgical restoration at this time is inadvisable and a simpler method should be sought. Loosely packing and distending the vagina with gauze following delivery is effective in accomplishing this in some cases.

Both the immediate and intermediate operations present technical difficulties that are not present in the interval operation, but if performed in selected cases, and limited to the cervix and perineum, such operations can be recommended as offering definite advantages to the patient.

EDWARD L. CORNELL, M D

Chesterman, J.: Puerperal Infection Due to Hemolytic Streptococci. *Med J Australia*, 1938, 1: 237

Puerperal sepsis is due to the invasion by pathogenic organisms of the raw wounds that remain after parturition or abortion. Tables and graphs illustrate that puerperal sepsis is responsible for about one-third of maternal deaths, that the death rate in Australia has remained unaltered for many years, that the hemolytic streptococcus is found in nearly 40 per cent of the more severe puerperal infections, and that it is responsible for about 80 per cent of the deaths from sepsis.

Studies by Lancefield and others have shown that hemolytic streptococci can be divided into several different types. Those producing pathological conditions in man all belong to one group, designated A. Streptococci recovered from the cervix and vagina before labor rarely belong to Group A, the women upon whom these are found seldom develop sepsis. Therefore it is reasonably certain that pathogenic hemolytic streptococci do not normally inhabit the female genital tract, but when they gain access to the genital tract of parturient women they nearly always produce a pathological state. Such infections are extrinsic and their source should be sought.

The author reports the results of 286 cervical swabbings taken from patients in the Women's Hospital, Sydney. There were two groups: (1) those taken on the third day of the puerperium from 100 consecutive women delivered in the hospital, and (2) those taken from women delivered in the hospital, or admitted after delivery outside, or suffering from abortion, who sustained a temperature of 101° F for which no extragenital cause was found. In the first group, 11 had a febrile puerperium. Hemolytic streptococci were found in 4 febrile cases and 1 afebrile case. The former belonged to Group A, the latter did not.

Among 1,900 consecutive hospital deliveries in the second group, 122, or 6.5 per cent, had a febrile puerperium and in 1.6 per cent it was due to the hemolytic streptococcus. Of 49 patients admitted after delivery of a viable child elsewhere, 20 had a febrile puerperium, in 19 per cent it was due to the hemolytic streptococcus. Of 363 patients admitted with abortion, 51 were febrile, and in 11.1 per cent of these the condition was associated with the hemolytic streptococcus.

The following clinical and therapeutic considerations are discussed:

1. The nature of the labor, more than half were normal.

2. Parity, this had no bearing.

3 Age the average age of the infected women was five years greater than the average age of all the women delivered

4 The day of onset of the fever, usually on the second, third, or fourth day of the puerperium the temperature rose suddenly to from 102° to 105° F

In the treatment good nursing fire hair attention to bowel action sleep and a diet high in Vitamin A are emphasized Repeated transfusions and iron and liver therapy are advised Occasionally it may be necessary to promote uterine drainage Intravenous chemotherapy and specific antisera are not considered of value

Of 57 patients, 41 were treated with sulfonamide Four patients in this group died 3 of the 4 had extensive infection on admission It is the author's impression that if the infection is recognized early as being due to a hemolytic streptococcus adequate doses of sulfonamide in addition to the other measures already mentioned will help to prevent spreading beyond the uterus with its resultant high mortality Toxicity from sulfonamide is discussed briefly The importance of prophylaxis is emphasized proper masking of the attendants the exclusion from the delivery room of those with infected throats, the search for possible sources of infection and the isolation of infected cases are all mentioned

DANIEL C MORTON M D

Trillat P and Durthiault R The Treatment of Puerperal Infection by the Continuous, Slow Intravenous Injection of Alcoholized Glucose Solution (Le traitement de l'infection puerpérale par les injections intraveineuses lentes et continues de sérum glucosé et alcoolisé) *Gynec et obst* 1938 37 241

Trillat and Durthiault report 4 cases of puerperal infection in 3 of which the blood cultures were positive in 1 case for the streptococcus in another for the enterococcus and in the third case for the

staphylococcus albus and the bacillus subtilis (two cultures) All of these cases were of a severe type and the patients had failed to improve with the usual methods of treatment they were finally treated by the continuous intravenous injection of an alcoholized glucose solution Two of the patients recovered, and 2 died In 1 death was found to be due to an acute diffuse pulmonary tuberculosis a latent tuberculosis having apparently been activated by the post partum infection and by the treatment the blood culture in this case was negative In the other fatal case some improvement was noted when the treatment was instituted, but it was apparently too late

The solution employed consisted of 0.5 cc of ethyl alcohol (95 per cent) and 50 gm of glucose, and water to make 1000 cc It was put up in containers holding 500 gm The apparatus was adjusted to inject 1 liters of the solution in twenty-four hours, about 30 drops per minute As a rule the injection was continued for four days When the treatment was first instituted the patient usually had a chill, but no further chills occurred patients who responded well to the treatment noted a feeling of well being after the first few hours

This form of treatment is recommended especially, in cases with repeated chills which indicate a spread of the infection and invasion of the blood stream even if no chills occur the treatment is also indicated if the blood culture is positive In the authors' patients who recovered, the treatment was not instituted until the fifth or sixth day after repeated chills had occurred daily The presence of tuberculosis is a contra indication to the use of this treatment Hypertension and cardiac disease may also be considered as contra indications The same method of continuous drop by drop intravenous injection might also be employed for the administration of other drugs in puerperal infection such as sulfanilamide

AUCE M MEYERS

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Staehler, W · Local Circulatory Disturbances of the Kidney (Zur Klinik der oertlich begrenzten Zirkulationsstörungen der Niere) *Beitr z klin Chir*, 1938, 167 189

The author distinguishes arterial and venous circulatory disturbances and adds a brief report of animal experiments

Total occlusion of the renal artery may occur acutely as embolism and chronically as thrombosis In both instances nephrectomy must be considered However, in arterial occlusion it often fails to avert a fatal outcome both because of the underlying heart disease and because of the anuria of the sound kidney which results from secondary embolism

The occlusion of the individual branches leads to infarcts There is always, however, renal parenchyma which does not become necrotic Consequently, the affected kidney is capable of excreting urine which, under these circumstances, contains much blood.

Numerous infarcts may lead to infarct-contraction of the kidney Clinically the symptoms may be quite insignificant. However, severe hematuria, pain, suppression of the renal function, and a negative excretion-pyelogram may be observed In 40 per cent of the cases the signs were bilateral, in from 90 to 95 per cent associated heart lesions were noted. The prognosis depends upon the severity of the heart disease and the size of the infarcts After from two to five weeks the kidney begins to recover Usually it should not be removed On the other hand, when severe pains and impairment of function are present decapsulation is recommended

Among the circulatory disturbances of the small arteries and capillaries, symmetrical cortical necrosis, the eclamptic kidney, and focal nephritis are discussed The first two conditions are alike in that they appear in pregnancy or shortly thereafter They are different because cortical necrosis is attributable to toxic, vasoparalytic, and degenerative changes in the terminal vessels, while the eclamptic kidney is caused by spasm of the smallest vessels. Convulsions never occur in the former but are usual in the latter Since crises of the cerebral vessels also have a part in eclampsia, decapsulation and arterial enervation cannot basically control the eclamptic attacks

As to the cause of the embolic focal nephritis, tonsillitis, dental granuloma, and many other suppurative diseases are to be considered Focal nephritis may disappear rapidly, but may also persist for years and evoke frequent, painful recurrences According to Kretschmer, half of the cases of essential hematurias are in reality cases of circumscribed glomerulonephritis The removal of the original focus is therapeutically most important

Three varieties of renal venous thromboses are to be distinguished the propagated extra renal type, the renal inflammatory form, and the marantic venous thrombosis of nursing infants Severe hematurias necessitate nephrectomy

In animal experiments, the clamping of the renal artery for a period of from two to four hours resulted in the deposition of calcium in the cortical portion of the kidney. These deposits were capable of retrogression. (BUETTNER) J M SALMON, M D

Davis, D. M.: Conservative Methods in the Surgery of the Chronically and Severely Infected Kidney. *New England J M*, 1938, 218 947

Of the commoner urological operations, nephrectomy for pyonephrosis shows the highest operative mortality, although the author found difficulty in determining the exact figure because the term "pyonephrosis" is applied by various persons to different lesions The figures are confusing and unsatisfactory, and do not permit the establishment of proper standards for the treatment of pyonephrosis, they vary tremendously and must, therefore, be regarded with a shrewdly appraising eye There is no distinct dividing line between pyonephrosis and infected hydronephrosis, and the term "pyonephrosis" conveys no information as to the existence or severity of complications, which are of the utmost importance to the surgeon

As a matter of fact, it makes little difference whether the obstructed kidney is filled with pus or with clear, sterile urine, so long as there is no perinephric inflammation, the pyonephrosis is then devoid or almost devoid of perinephritic changes, and the operative difficulties are minimal The disease runs a milder course, and even if the infection is acute and preliminary nephrostomy is necessary, the secondary nephrectomy should be easy. The results in cases of this type should be good if the opposite kidney is healthy For these cases the term "pyonephrosis" should be abandoned in favor of the term "infected hydronephrosis," regardless of the character of the renal contents

There is another group of cases in which the perinephric inflammation plays a most important part Abscesses may occur, but fibrosis is inevitable, and this determines whether the surgical problem will be easy or difficult The fibrosis may vary in amount and location, it may be very extensive about the kidney, and yet not obliterate the line of cleavage between the kidney proper and the inner surface of the true capsule It is upon the latter pathological fact that the operation of subcapsular or intracapsular nephrectomy is based This operation avoids the separation of dense and widespread adhesions, with the danger of traumatic shock or injury to other vital organs, such as the vena cava, aorta, pleura, intestine, pancreas, and liver In some cases

of pyonephrosis the line of demarcation between the kidney and its capsule may be partly or entirely obliterated leaving in extreme cases nothing but the infected cavity of the renal pelvis surrounded by dense scar tissue without even microscopic remains of kidney tissue. The problem in such cases involves three other possible factors (1) a congenital anomaly, such as horseshoe kidney, double kidney, ectopia, or polycystic disease (2) disease of the opposite kidney which requires simultaneous treatment or restricts the available alternatives or (3) general disease which may diminish the resistance of the patient. Therefore, in the cases of pyonephrosis with perinephritic fibrosis there are the greatest variations in operative suitability and prognosis.

The author has despaired of achieving a pathological classification simple enough to be useful in the more accurate evaluation of the success or failure of surgical treatment. The operations available under these circumstances are lumbar extracapsular nephrectomy, lumbar intracapsular nephrectomy, transperitoneal nephrectomy, and permanent nephrostomy. Since it is better to admit that it is sometimes impossible to remove the kidney and save the patient the author thinks that other possible methods should be developed.

If nephrectomy may possibly be avoided for a good reason the most complete information about the condition present should be sought. If it is so severe that immediate operation (usually nephrostomy) is necessary certain studies may be made later. In a less severe illness the usual thorough urological study is made. With pyelography it is possible to draw from the nature of the pelvic outline fairly accurate inferences as to the degree and location of the perinephritic fibrosis. If secondary nephrectomy is considered and if the nature of the problem hinges upon whether or not the kidney is still able to secrete urine. If the kidney is still secreting considerable urine, nephrectomy can be avoided only by providing adequate drainage. Except with permanent nephrostomy this may be accomplished only by restoring the ureteral function by dilatation or a plastic operation. If the kidney secretes only a small amount of urine efforts may be made to remove remaining portions of the parenchyma by fragmentation to interfere with the remaining blood supply or to cause atrophy by chemicals or deep x-ray application. If such efforts succeed, urinary secretion is permanently suppressed and the following considerations apply.

If the kidney produces no urine the condition is that of an infected cavity (only the renal pelvis, pelvis and dilated ureter or an added cavity of a perinephritic abscess). All of these deal if adequate drainage is provided for a sufficiently long time. The drainage aperture must be of generous size and drainage material must be kept in place until firm healing occurs from the bottom of the cavity. The ureter in such cases must be given careful attention. If it is not dilated the obstruction is at or near the ureteropelvic junction and no special attention is

necessary. However if the ureter is dilated the nature of the obstruction becomes important. Dilatable strictures require suitable dilatation and respond well to this procedure. If dilatation is impossible the ureter should be treated before attacking the kidney either by a plastic or some other operation to restore its patency by removal through an inguinal incision or by bringing it to the surface and draining it thoroughly. Such operations should be carried down to the point of obstruction.

Observations at the operating table determine the procedure to be followed in the region of the kidney. If nephrostomy is done the presence or absence of urine in the drainage can be determined. In doubtful cases the urea content is decisive. Functional studies can be made with phenolsulfonphthalein and indigo carmine. Colored solutions injected into the drainage tube show whether any of the pelvic contents reach the bladder. Roentgenographic studies are the most instructive. The pyelographic medium is easily injected directly through the drainage tube. Fluoroscopy during the injection shows whether the fluid is reaching the bladder, and also how quickly and completely the pelvis empties. If ureteral drainage has become adequate blocking of the drainage tube for twenty-four hours answers the question. These methods, and a thoughtful interpretation of the findings make for accurate and reliable preoperative diagnoses which permit the selection of the best and least dangerous procedure for relief.

LEWIS NEWELL M.D.

Leadbetter W. F. and Burkland C. E. Hypertension in Unilateral Renal Disease. *J. Urol.* 1936 39 611

The authors review the literature concerning the experimental production of hypertension in animals by constriction of one or both renal arteries. They also mention the case of a patient of Lewis, in whom hypertension was relieved by nephrectomy of a kidney containing an infarct.

Their own case demonstrates the clinical application of experimental work which has been done. A five and one-half year old colored boy with hypertension of three years standing was apparently cured by the removal of an ectopic kidney, the main artery of which was partially occluded.

The authors believe that their experience should stimulate the search for unilateral kidney pathology in cases of malignant hypertension in which sympathectomy or excision of adrenal tissue is being considered.

THEOPHIL P. GRAHAM M.D.

Boyd C. H. and Lewis L. G. Nephrectomy for Arterial Hypertension. *J. Urol.* 1933 39 627

The authors report the case of a man thirty-one years of age with arterial hypertension showing typical eye ground changes and who a number of weeks previously had given a history of acute abdominal pain.

Both adrenal glands were explored and found to be normal but a large infarct was observed in the

right kidney A right nephrectomy was performed, which was followed by a slow reduction of the blood pressure to normal The authors believe that the reduction of the blood pressure was due to the removal of the diseased kidney, since it was gradual rather than sudden, as would have been the case had the reduction been due to partial denervation of the adrenal glands, as described by Crile

THEOPHIL P GRAUER, M D

Godard, H · Results of Renal Decapsulation (Quelques résultats de la décapsulation rénale) *J d'urolog méd et chir*, 1938, 45 289

According to Godard, renal decapsulation, has been employed in the treatment of postoperative anuria for the past twenty-five years, yet the method is still under investigation and extensive discussion The results obtained with this surgical intervention are inconstant and some surgeons firmly question its value

From his personal experiences, the author believes that renal decapsulation is positively indicated in cases in which the prognosis is hopeless

Godard performed a successful renal decapsulation in a ten-year-old girl, who became completely anuric after a simple appendectomy The decapsulation was performed bilaterally and about twenty-four hours later micturition began spontaneously A biopsy specimen taken from the kidney showed flattening of the cells lining the convoluted tubules, and Henle's loops as well as the collecting tubules were filled with desquamated epithelial cells One year later, a kidney function test revealed a persistent renal insufficiency Four years later the child was operated upon again and the biopsy specimen showed the presence of a chronic glomerulonephritis which, in the author's opinion, has a rather unfavorable prognosis The renal decapsulation, however, had effected a temporary amelioration

Encouraged by these results, renal decapsulations were performed in 2 other cases The second patient presented a subacute glomerulonephritis following scarlet fever, and the third patient suffered from a toxic nephrosis due to mercurial poisoning Both cases ended fatally following surgical intervention

This problem was studied further experimentally on rabbits which were given intravenous injections of mercury and whose kidneys were subsequently decapsulated About 40 per cent of the animals survived

In a series of control animals which were poisoned in the same way but whose kidneys were left intact, the percentage of spontaneous recoveries was found to be approximately the same

In another series of control animals, the author studied the urinary output as influenced by renal decapsulation He found that immediately following the operation, the urinary output falls abruptly The urea excretion, however, is not influenced by renal decapsulation, but this finding should be further studied for confirmation

In general, Godard believes that renal decapsulation performed on damaged kidneys usually yields unsatisfactory results The best results are obtained in functional disturbances of the kidney, especially those of nervous origin, such as lesions of the splanchnic and sympathetic nerves of the renal plexus and nephritis secondary to spinal anesthesia or to cerebral lesions In these cases an anaphylactic reaction sometimes follows renal decapsulation, this being due to the proteolytic products formed at the site of the operation This phenomenon manifests itself by a moderate hemorrhagic infiltration of the kidney, involving especially the convoluted tubules

With reference to regeneration of the renal capsule, the author found experimentally that in the animal which has been operated upon the capsule is regenerated In 2 animals the operation was followed by the formation of a dense fibrous perirenal capsule infiltrated in places by calcareous deposits probably derived from the destroyed glomeruli

RICHARD E SOMMA, M D

Ockerblad, N F · The Surgery of the Human Ureter. *J Urol*, 1938, 40 101

The surgical attack upon ureteral calculi is of comparatively recent origin It is only since the perfection of the x-ray and of the methods of operative cystoscopy that real progress has been made Before the days of the cystoscope and the x-rays the surgeon could only guess at the size and location of the stone He tried to locate the calculus by the distribution of the pain, which was as likely to lead him astray as it was to lead him to the stone Today we have a large number of cases in which ureteral stones have been removed, but general surgeons are skeptical of the possibility of removing ureteral calculi by cystoscopic means and they believe, generally, that all ureteral calculi will pass if given time

No one knows how large a stone must be before it can be stated confidently that the stone will pass It is safe to say that the greater number pass down the ureter and out with the urinary stream while they are as yet microscopic in size Practically all ureteral stones originate in the kidney The ureter is such a delicate tube that most urologists are exceedingly cautious as to how they examine it, and the surgeon who tries to extract a ureteral calculus which is above the iliac crossing may get into serious difficulty

A calculus which has become impacted in the ureter, which has not moved for weeks or months and shows no signs of moving, is best removed by open surgery The author reviews operations on the upper, middle, and lower thirds of the ureter. He also refers to the surgery of ureteral anomalies and ureteral diverticula The operation of ureterectomy and of ureteral re-implantation into the bladder is also considered

In referring to implantation of the ureters into the intestines, the author states that before attempting this procedure one should be thoroughly familiar with the steps of the operation, and that it is best

if the operation be done first on a number of dogs. It is encouraging that leading surgeons are becoming more conservative in the management of such operations.

The surgery of ureteroceles, ureteral denervations, ureterostomies, ureteral fistulas and strictures with drainage of the ureter are all briefly considered.

C TRAVERS STEPITA M D

BLADDER, URETHRA AND PENIS

Ward R O Fifty Three Cases of Vesical Diverticula *Brit J Surg* 1938 25 799

The author presents a clinical and critical survey of 53 cases of vesical diverticula which includes the etiology, diagnosis, complications and surgical treatment of this condition. From his case summaries he concludes that:

- 1 Diverticula are rarely congenital in origin.
- 2 Their formation is in most cases due to an obstruction to the outflow of urine from the bladder.
- 3 They are rarer in the female in which sex obstruction is uncommon.
- 4 Infection and calculus formation are frequent complications; neoplasms are less common.
- 5 Cure is obtained by diverticulectomy combined with treatment of the obstruction, if any be present.

The author states that a vesical diverticulum does not give rise to any symptoms which are unique and that most diagnoses are most conclusively established by cystoscopy and cytography. He points out that prostatic obstruction must be carefully sought when a diverticulectomy is performed and that if the orifice of a diverticulum which is to be removed is at all near that of the ureter it is sound practice to pass a rather stiff bougie which serves as a guide to the situation of the ureter.

Diverticulectomy was performed in 36 patients with only 1 death due to the operation.

D E MURRAY M D

GENITAL ORGANS

Walker K A Survey of Prostatic Enlargement and Its Treatment *Brit M J* 1938 2 53

The author has surveyed the work that has been carried out by innumerable researchers in the laboratory and operating theater in the field of prostatic enlargement during the past twenty years and states that there is no reason to be dissatisfied with the results. Definite progress has been made both in our understanding of the cause of enlargement and in our methods of dealing with it. The investigations of the biologist and the biochemist are now leading us in a direction which may well mean that within a few years we shall be able to prevent the occurrence of this condition and possibly cure it once it has arisen.

Experiments suggest that enlargement of the prostate in man may be due to the action of an excess of estrogenic substance. It has long been known

that the male body forms estrogenic as well as male hormones and that both of these substances can be extracted from the testis. It is therefore not illogical to suppose that an upset in the normal balance between these two antagonistic principles may be the cause of prostatic enlargement. However, no direct confirmation of this theory has to far been obtained from any quantitative estimate of the hormones formed by patients suffering from prostatic enlargement. There is plenty of experimental support for the attempt to deal with human enlargement by means of endocrine therapy either directly by the injection of male hormone or indirectly by the use of gonadotropic substances. Until recently these attempts have been handicapped by the difficulty of the injection of enough hormone to produce an effect but with improvements in the methods of extraction and of manufacture this difficulty is being overcome.

Reference is made by the author to the original Sternbach operation of ligation of the vas and to the Niehaus modification of ligation of the efferent ducts of the testicle. Surgery of the prostate and prostatic obstruction are reviewed with regard to the perineal operation, suprapubic prostatectomy, the Harris technique and the present position of the Harris operation.

Finally, the author states that even if the efforts of prostatectomists to rid the original Freyer operation of its shortcomings have not so far met with success there is no reason to doubt that in the end this also will be achieved.

In the meantime close co-operation between the clinicians and the designers of instruments has provided a valuable alternative method of surgical intervention in the form of transurethral resection for prostatic obstruction.

C TRAVERS STEPITA M D

Huggins C and Noonan W J Spermatocoele Including Its X Ray Treatment *J Urol* 1938 39 784

Of 55 patients with spermatocoele 46 were asymptomatic, 8 complained of slight pain or a dragging sensation of weight in the scrotum and 1 experienced some interference in walking. In the majority of patients the enlargement was not noticed until after the third decade. In none of the patients was a traumatic history obtainable, under observation though several patients attributed the swelling to trauma of the testis. The largest spermatocoele contained a 360 c cm of fluid.

Spermatozoa were always found on aspiration of fluid from the cyst. Usually their number was large which proved the existence of a direct connection between the spermatocoele and the testis. The sperms immotile after aspiration were always activated by standing at room temperature for a few minutes. The cyst transmitted light with ease in every case which is contrary to statements appearing in several textbooks that a spermatocoele cannot be transilluminated. Since the anatomical

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mechanism causing the spermatocele is unknown, the condition may be regarded as a partial obstruction to the sperm-conducting system

The problems of permeability of the membrane are interesting. It has been shown that while the absorption of phenolsulfonphthalein from a spermatocele is slower than absorption from subcutaneous tissue, it is much more rapid than such absorption from a hydrocele, and that fluid from a spermatocele contains no inorganic phosphate, and only traces of reducing substance such as glucose. Therefore, there is a selective permeability in this membrane, and phosphate ions do not pass from the plasma into the fluid. The injection of phosphate into a spermatocele usually was retained in high concentration for two days, which showed that the membrane was relatively impermeable to certain ions in both directions. Since many spermatozoa are present, the indication is that the fluid which surrounds the sperms coming from the testis contains no inorganic phosphate, or, at most, only small amounts.

In the cases of 33 patients no treatment was given. Resection of the spermatocele for deformity or other symptoms was done in 11 cases, and orchidectomy was done in 2 cases for infection following aspiration. Aspiration of a spermatocele is not always an innocuous procedure, and infection may occur despite clinical asepsis. Since a spermatocele always contains sperms, treatment with x-rays was tried and it was always found that it caused the cyst to disappear. Nine patients were treated according to the following technique.

The uninvolved testis was shielded with lead and the involved testis with a filter varying from 0.5 to 1.2 mm of copper and 2 mm of aluminum. The involved testis received from 200 to 300 roentgen units measured in air with 200 kv, 10 to 25 ma, and 50 cm focal skin distance. The intensity varied from about 10 to 40 roentgen units per minute. A total dose of 600 roentgens was applied in two or three treatments following one-day or two-day intervals.

The spermatocele slowly decreased in size and usually disappeared in about eight weeks. Aspiration of fluid forty-seven and fifty-one days after treatment showed most of the sperms to be immotile, with many isolated heads and tails. Four patients were found to need a second course of treatment, but none needed a third course. The final state of the patient revealed a collapsed sac without fluid, the walls of which could be rubbed together with a velvety feeling. The testis decreased slightly, if at all, in size, the greatest reduction being 33 per cent. No change occurred in the sexual libido or *potentia*. This treatment was given only in the cases of old men, it is contra-indicated in younger men because excision of the sac is simple and because the period of sterility from x-rays is unknown. Irradiation of the testis may result in deformed products of conception and monsters, such as may follow ovarian irradiation. LOUIS NEUWELT, M.D.

Denecke, K.: Spontaneous Restoration of the Lumen of the Vas Deferens after Resection (Spontane Wiederherstellung des Samenleiterkanals nach Resektion) *62 Tag d. deutsch. Ges. f. Chir.* Berlin, 1938

A case is reported in which after resection of 2 cm of each spermatic duct, for eugenic reasons, the patient's procreative power returned. Secondary resection performed eighteen months later revealed the interesting fact that the stumps of the spermatic ducts had been drawn together again by contraction. Histological examination of serial sections showed a marked generative tendency of the duct endothelium. Individual small, newly formed canaliculi of the spermatic duct were found. Experiments performed upon dogs in this connection proved that there is a strong generative tendency of the spermatic duct. Therefore, in the resection of portions of the spermatic duct, the possibility of restoration of the duct after a certain time must be kept in mind. It is essential that the portions be at least 6 cm. long.

J. M. SALMON, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Talbot and Parlange Osteomyelitis Due to Friedlaender's Pneumobacillus (Les ostéomyélites à pneumobacille de Friedländer) *Reu de chir* Par 1938 37 271

Talbot and Parlange note that septicemia due to the Friedlaender bacillus occurs most frequently in adults it is manifested in three forms a pure septicemia without local manifestations a septicemia with a single local focus, and a septicopyemia with multiple localization. The latter form is relatively rare and the localization of the infection in a bone—an osteomyelitic focus—is very infrequent. The authors report a case in which septicopyemia resulted from an ear infection with Friedlaender's bacillus with multiple localizations. One of the lesions was an osteomyelitis of the ulna. The osteomyelitis was of the non suppurative type, but the carious bone was removed the lesion extended for a time then healed spontaneously. A year later the patient was readmitted with a recurrence of the septicopyemia with multiple localizations but no bone involvement. The primary focus was found in the nasopharynx and cleared up under intensive local treatment. The authors find but 6 other cases of bone infection due to Friedlaender's bacillus reported in the literature the first by Lambret Blin and Carlier in 1908. These cases are briefly summarized.

The 7 cases reported including the authors case represent four types

1. A periosteal infection with abscess formation (2 cases)

2. An osteomyelitis with periosteal abscess (1 case)

3. A typical extensive osteomyelitis with pus formation and large sequestra (1 case). In addition there was a case in which not a long bone but the petrous pyramid was involved by an extensive suppurative osteomyelitis.

4. A non suppurative caries of the diaphysis (2 cases, including the authors case). In the authors case the bacillus was cultured from the carious bone removed at operation.

Various operative procedures in osteomyelitis due to Friedlaender's bacillus have been employed but none have had a definite curative effect. The process has continued to progress or has regressed spontaneously (as in the authors' case) without being greatly modified by the usual operative measures. The authors used an autogenous vaccine in their case on two occasions this vaccine caused reactions, sometimes late but did not prevent the appearance of new lesions. Chemotherapy may prove to be the treatment of choice. In the authors case ribazol (prontosil) and a sulfanilamide derivative proved to be effective mandelic acid was very effective in the

treatment of the infection in the urinary tract (pyelonephritis). At present no really effective treatment of Friedlaender bacillus infections is known. The primary focus of the infection is generally in the nasopharynx, and intensive local treatment of this focus is indicated in addition to general measures to build up the powers of resistance.

ALICE M MEYERS

Hellner H Differentiation of the Giant Cell Tumors from Osteogenic Sarcomas (Abgrenzung der Riesenzellgeschwülste von osteogenen Sarkomen) *62 Tag d deutsch Ges f Chir* Berlin 1938

The especially interesting clinical problem of giant cell tumors is of a diagnostic nature. The diagnosis of a bone tumor is possible only with an agreement of the clinical roentgenological and microscopic findings. There are of course many tumors in which the clinical and roentgenographic findings are sufficient for diagnosis but they are usually benign. In the borderline cases in those diagnosed with difficulty and in almost all of the cases of malignant bone tumors a correlation of the histological findings must also follow. Without a biopsy therefore the diagnosis cannot be made in these cases of bone tumors. However it is in the giant cell tumors that it is important to note (1) that giant cell like sections occur in the vicinity of osteogenic sarcomas and that sarcomas may appear as giant cell tumors (2) that giant cell tumors may undergo extensive morphological changes in which case attention is to be called particularly to the xanthomatous variations and the fibromatous and organizational processes (3) that infected or previously surgically attacked giant cell tumors show considerable cellular proliferations often with distinctly atypical nuclei, many mitoses and the disappearance of the ground substance which may give rise to pathological anatomical diagnostic mistakes in that it is impossible to exclude malignancy. The microscopic findings must therefore be brought into correlation with the clinicoroentgenological findings.

Clinically the following statements are true of giant cell tumors. They occur usually during young adult life between the ages of twenty and thirty years in about 40 per cent of the cases. Their usual location is in the lower part of the femur and radius as well as in the upper end of the tibia namely at the epiphyseal site in the long tubular bones. They produce no pain and develop slowly. Roentgenologically there is an eccentric but central involvement of an epiphysis mostly polycystic with a soap-bubble like light area. Destruction of the outer wall occurs and has given rise to misinterpretations. Even perforation into the joint and rupture through the skin though rare, has been described. In cases of giant-cell tumors the roentgenogram is never entirely reliable. On the whole it fails in

giant-cell tumors of the small bones. A giant-cell tumor of the os calcis may look like a Ewing sarcoma or a metastasis, and of a metacarpal or metatarsal bone like a chondroma. A giant-cell tumor of the ribs may look exactly like a metastasis or a solitary myeloma, and when a giant-cell tumor is located in the spine it is not definitely demonstrable roentgenologically and the diagnosis is usually a surprise.

The diagnosis of giant-cell tumor is often impossible by purely clinical means. The roentgenogram is applicable only when there are entirely typical changes in the epiphysis of the long tubular bones. It is misleading in cases which have been operated upon, which are infected, and which are advanced. It often fails in the diagnosis of giant-cell tumors in the flat and small bones. Biopsy is usually unavoidable. There are typical sources of error in the judgment of histological partial examinations. Therefore the agreement of the clinical, roentgenological and pathologico-anatomical findings is necessary.

The question whether a giant-cell tumor may become malignant and lead to metastasis and death has caused much discussion. The clearing of the problem has failed because of the fact that it was not known that osteogenic sarcomas have the same appearance as giant-cell tumors. The sarcomatous degeneration of a giant-cell tumor must be admitted, it can be demonstrated not only histologically, but often even better and earlier by clinical and roentgenological means. Often it affects older adults than those who usually present giant-cell tumors. The tumor that was previously considered as circumscribed and as benign suddenly becomes rapidly larger. There is impairment of the general health. Often there is a complaint of pain. The roentgenogram shows a considerable destruction, dissolution of neighboring portions of the bone, and the disappearance of the curd-like residue in the interior of the tumor. If such a behavior, which no longer responds to the picture of the benign giant-cell tumor, is demonstrable clinically and roentgenologically, and if the biopsy shows the predominance of a spindle-celled atypical tissue with disappearance of the giant-cells and also a decrease in the number of nuclei and atypical giant cells, the presence of a sarcoma on the base of a giant-cell tumor is certain. However, viewed as a whole, this outcome is rare, and these observations, of which there are at least a dozen in the literature, do not change the fact that the majority of giant-cell tumors should be considered prognostically favorable. The sarcomatous degeneration of benign, typical giant-cell tumors is found in association with advanced age, repeated interventions, infection, irradiation, and a hereditary familial predisposition to the blastoma.

(HELLNER) LOUIS NEUWELT, M D

Waldenstrom, H : The First Stages of Coxa Plana.
J Bone & Joint Surg, 1938, 20 559

Coxa plana means flat epiphysis. The etiology of this disease is still unknown. This condition is also

Fig 1-A

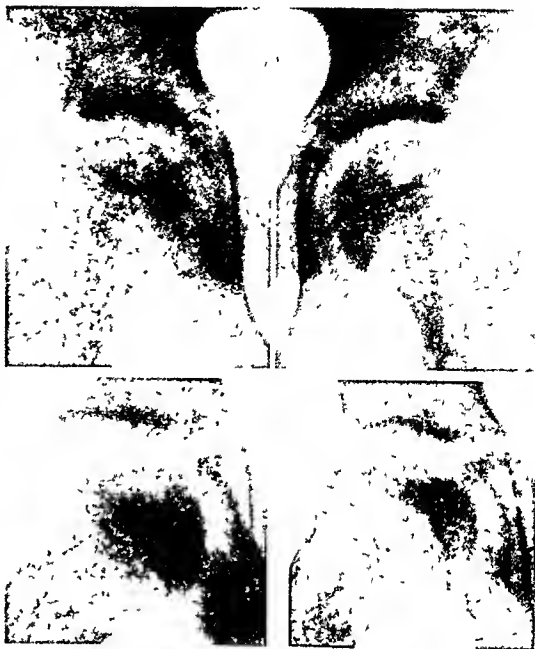


Fig 1-B

Fig 1-C

A boy, aged nine years, was admitted to the hospital on September 6, 1932, with a slight limp of three months' duration.

Fig 1-A Roentgenogram, taken on admission, showing the epiphysis of the right femur to be lower than that of the left and flattened on its upper portion, as well as an increase in the distance between the epiphysis and the bottom of the acetabulum.

Fig 1-B Lateral view (Lauenstein's position), taken on admission.

Fig 1-C Lateral view, taken one year later.

known as Legg's disease, Calvé's disease, Perthes' disease, and osteochondritis deformans.

A study of anatomical specimens has shown that the pathological process is a primary necrosis followed by resorption of the necrotic cancellous tissue, and lastly a formation of new bone and cartilage. This paper is based on studies made of patients treated personally by the author during the past thirty years.

The first symptom of coxa plana is a limp, sometimes associated with pain in the hip, or more commonly, in the region of the knee. There is also a restriction of the mobility sufficiently definite to be measured when compared with that of normal hips.

The roentgenographic appearance of the two hip joints when taken in the anteroposterior direction only, usually does not show the early changes. However, when roentgenograms are taken by lateral projection (with the femur in flexion and abduction) the deformity is more pronounced. Two or three



Fig 2 A



Fig 2 B



Fig 2 C

A boy aged seven years was admitted to the hospital in January 1936 with a very slight limp of six weeks' duration.

Fig 2 A. Anteroposterior view on admission.

Fig 2 B. Lateral view on admission.

Fig 2 C. Anteroposterior view one year later.

months after the onset of the limp the characteristic signs of coxa plana begin to be visible: that is the normal structure of the cancellous tissue in the upper part of the epiphysis on the articular surface begins to be resorbed. The changes in the roentgenograms taken at this early stage are very slight and a minute comparison of the two hip joints is required to discover them.

In these minute roentgenographic studies the form of the two sockets is identical. In comparison of the femoral epiphyses the epiphysis on the involved side is found to be lower and shows a distinct flattening of the part facing the roof of the acetabulum. In the roentgenograms taken with the femur

in flexion and abduction the flattening is still more apparent. Flattening mainly involves the upper anterior part whereas the lower portion retains its normal shape. The necrosis is never limited to the lower part of the epiphysis.

Examination of the roentgenograms of these early cases of coxa plana shows a constant change in the diseased hip joint consisting of an increase in the distance between the femoral epiphysis and the bottom of the acetabulum (Figs 2 A, 2 B and 2 C).

Coxa plana has been found to arise in a primarily normal joint. In the matter of treatment, the author warns against any radical operative procedure. If anything is to be done it should be done before the stage in which extensive necrosis of the epiphysis and sometimes of the adjacent portion of the neck occurs. It should be remembered that most cases heal with a deformity which is only slightly troublesome and it is important therefore never to use any operative treatment with the possible exception of drilling through the epiphyseal cartilage (Figs 2 A, 2 B and 2 C).

The most important factor is conservative treatment. From one to two months rest in bed is advocated. The patient may then be up and about on crutches for at least a year. Plaster and immobilizing bandages should never be used. All such procedures tend to impair the circulation and nutrition of the joints and may therefore be injurious.

ROCHARD J. BERNIER, JR. M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

Young, C. S. An Operation for the Correction of Hammer Toe and Claw Toe. *J. Bone & Joint Surg.* 1935 30 715.

The essential principles in the satisfactory treatment of hammer toe and claw toe deformities are tenotomy of the extensor tendons lengthening of the contracted soft tissues and arthrodesis of the proximal interphalangeal joint. The latter is performed by reshaping the head and distal end of the proximal phalanx into the form of a truncated cone and fitting this into a cavity of similar shape in the base of the second phalanx. For claw toe deformity of the fifth toe resection of the head and distal portion of the first phalanx is advisable.

CHESTER C. GUY, M.D.

FRACTURES AND DISLOCATIONS

Plaut, H. F. Fracture of the Atlas in Automobile Accidents. The Value of X-Ray Views for Its Diagnosis. *J. Am. Med. Ass.* 1935 110 1892.

Plaut draws attention to fractures of the atlas caused by automobile accidents. These injuries are not as rare as formerly assumed. Proper diagnosis and treatment will prevent unpleasant sequelae and are important for medicolegal reasons. After a brief description of the anatomy the typical sites for fracture of the atlas are noted: the posterior arch

where it is weakened by the groove for the vertebral artery, and the anterior arch. Fractures of the transverse processes and in the lateral masses are the exception. The mechanism which produces these fractures consists of vertical pressure on the skull with the cervical spine fixed in a straight position, this results in the lateral masses of the atlas becoming squeezed between the occipital condyles and the axis and being displaced laterally, which bursts the atlas ring at its weak points in the posterior or anterior arches.

The clinical signs are referred to the upper cervical region, with pain chiefly in the upper neck, mainly in the nuchal groove, rigidity, and impairment, particularly of head flexion. Patients frequently support the head with their hands. In anterior arch fractures, paravertebral hemorrhage may interfere with swelling. Cord injuries are rare compared to other cervical fractures. Conclusive diagnosis is made by roentgen examination.

The author recommends that the usual roentgen views be made first, and that special views be added when necessary. If the patient can sit, a lateral view from a distance of 6 ft is recommended. Otherwise the film is placed at the side of the neck with the patient supine and the tube pointing horizontally. The anteroposterior view through the open mouth is taken when possible. The anterior arch may be visualized by a nearly axial view similar to that used for showing the antra, the central ray is directed over the vertex, the atlas being projected in the space between the mandible and the posterior circumference of the occiput. A special view of the anterior arch is made in a postero-anterior direction with a dental film pressed against the anesthetized posterior pharyngeal wall, or in a vertical position between the molars.

Treatment consists of immobilization. Plaster casts, traction, the Thomas collar, and, rarely, operations are used. Pseudarthroses are common. The majority of the patients regain their full occupational capacity. DANIEL H. LEVINTHAL, M.D.

Milch, H: The Treatment of Dislocation of the Shoulder. *Surgery*, 1938, 3 732

The author approves of the manipulative method of Kocher which has largely superseded many other methods for the reduction of acute anterior subcoracoid dislocations of the shoulder, but cites 2 cases in which the humerus was fractured during the manipulation.

All shoulder muscles exert their forces on the dislocated and on the normally placed humeral head. It is hardly conceivable that muscles adapted to a normal position should not exert incalculable abnormal stresses in the suddenly altered relationship between the humeral head and the glenoid cavity. These abnormal stresses may make a closed reduction difficult or impossible. Many dislocations, previously irreducible, yield under general anesthesia after relaxation of the tense muscles. The resultant actions of the peripheral musculature of the shoulder

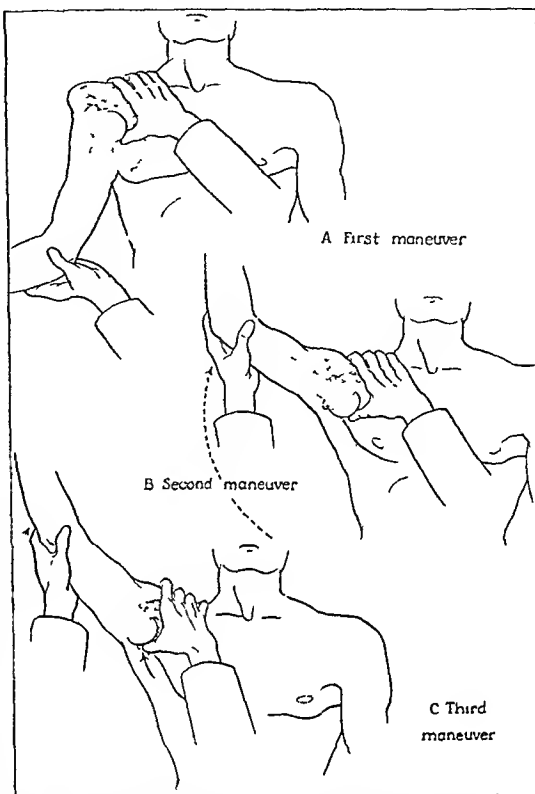


Fig 1 A, First maneuver the patient supine, the surgeon's right hand is braced against the shoulder, while the thumb fixes the humeral head, B, second maneuver the patient's dislocated arm is abducted in external rotation, the thumb pressure against the humeral head is still maintained, C, third maneuver with the arm in the completely abducted position, the surgeon's thumb gently pushes the humeral head over the glenoid ridge into the fossa.

depend upon the relationship existing between their individual direction and the axis of the humeral shaft. The excursion field in the glenohumeral joint is from 110 to 120 degrees. In an overhead position, all muscles assume a marked symmetry of disposition, the cross-stresses due to the oblique course of the different muscles are absent or are reduced to a minimum.

The muscles about the shoulder may be divided into three groups forming conical figures. The first group consists of the supraspinatus, the infraspinatus, the teres minor, and the subscapularis which converge on the apex of a small inner cone to form the musculotendinous cuff described by Codman. The second group is made up of the pectoralis major, the latissimus dorsi, and the teres major. The apex of this larger and more superficially situated muscular cone is located further distally on the shaft of the humerus. The third group consists of the deltoid, the

coracobrachialis the biceps and the triceps which form a cone whose apex is still more distally placed. The apex of each of these muscular cones is on the humerus and in the abducted position their axes are in general collinear with each other with the shaft of the humerus and with the midline of the scapula.

No traction is used in the method of reduction advised by the author. While the affected arm is being abducted into an overhead position and the shoulder is in external rotation the head of the humerus is supported by the surgeon's thumb so that it cannot move from its dislocated position. The head rotates in the supported position and does not move downward as the arm moves upward. As a consequence, the already tense nerves are not stretched further. The external rotation releases the twisted capsule. Once the arm has been brought into complete abduction in an overhead position all cross stresses exerted by all muscles have been eliminated; the head can be gently pushed over the rim of the glenoid and the dislocation reduced.

This method of abduction, external rotation and pullover has been used with success in several cases of subcoracoid types of dislocation, in one case of supraglenoid dislocation and in one case of fracture dislocation for which open reduction had been advised.

ROBERT P. MONTGOMERY, M.D.

Wang C. W. The Treatment of Old Posterior Dislocation of the Elbow. *Chinese J. J.* 1938, 35, 539.

Closed reduction of posterior elbow dislocations should not be attempted if the injury is older than ten days. After this period contraction of the soft tissues and shortening of the triceps tendon generally necessitate open reduction. In addition a thick mass of scar tissue forms in the space between the olecranon fossa and the incisure semilunaris and this must be resected and the fibrous ankylosis broken up if reduction is to be accomplished.

The most satisfactory approach is by a long incision extending down the medial side of the triceps tendon to the olecranon where it is curved laterally to the head of the radius. The posterior surface of the triceps tendon is exposed, the ulnar nerve dissected out and retracted and the triceps tendon cut transversely. The scar tissue on the posterior surface of the humerus and in the olecranon fossa is then dissected away as well as any scar tissue about the head of the radius. The latter may have to be excised if fractured or in order to reduce the dislocation. After reduction the condition of the anterior aspect of the joint is investigated. This area need not be explored unless flexion is limited in which case scar tissue should also be removed.

Arthroplasty of the joint with transplanted fascia or resection of the lower end of the humerus will occasionally be advisable in old neglected cases in which there are complicating fractures or in which fibrous ankylosis is extreme.

The triceps tendon is then sutured with the arm in flexion. Heavy silk is used unless the cut end

cannot be approximated in which case fascial transplants from the thigh are taken to close the defect. A Y of Z' incision in the tendon has been advocated to avoid this difficulty, but the transverse incision is preferable.

Active and passive motions are started on the tenth or twelfth postoperative day with gradual increase in motion within the limits of pain. Forceful manipulation is not advisable.

Twenty cases are reported. In 14 cases this operation was performed with excellent results in 5 good in 8, and fair in 1. Arthroplasty was done in 4 cases with satisfactory results in 3. Resection in 2 cases gave a good result. CHUANG C. CHU, M.D.

Roberts D. Fractures of the Phalanges of the Hand and Metacarpals. *Proc Roy Soc Med Lond* 1938, 31, 793.

This article is based on a series of 1,200 fractures of the phalanges and metacarpals. These injuries are very common and the frequency with which malunion and stiffness of the fingers are seen indicates the importance of correct treatment.

The terminal phalanges were fractured in 100 cases and the majority of the injuries were crush fractures often complicated by injuries of the soft tissue and the nail. Recovery depends largely on the progress of the soft tissue injury. Immobilization may be necessary for a short period if there is much swelling or infection, but every effort should be made to encourage active movements of the finger as soon as possible. Transverse fractures of the body of the terminal phalanx may be slow in uniting.

Fractures of the middle phalanx are relatively uncommon and there were only 51 cases. The fracture is through the middle of the shaft; the common deformity being one of forward angulation.

There were 286 fractures of the proximal phalanx. The typical fracture is a transverse one in some portion of the proximal half of the phalanx where forward angulation occurs, often complicated by lateral displacement and angulation together with a rotation deformity.

Treatment of the fractures of the proximal and middle phalanges is considered. It is very important not to treat these fractures with the finger in extension because this method often leaves some forward angulation or rotation deformity which will later impair motion. The use of traction on the finger held in the flexed position is necessary only in comminuted fractures with a tendency toward shortening. If a transverse fracture has been well reduced and splinted in a flexed position without traction there is no tendency toward recurrence. The finger should be parallel in the flexed position to obviate any rotation deformity. Often strapping the finger in a flexed position over a roll of bandage in the palm is sufficient. The finger is splinted for from two to six weeks according to the severity of the fracture and age of the patient. Movements are slow in returning; troublesome stiffness appears to be a complication and the most that can be done

for it is to shorten the period of immobilization as much as possible

There were 73 fractures involving the interphalangeal joints and the majority were chip fractures of the marginal joint surface complicating a sprain or dislocation of the finger. In the presence of any deformity, treatment by fixation in the flexed position, if necessary with traction, will minimize the displacement, but the prognosis is bad because painful stiffness of the affected joint is very common. Operative re-position may improve the roentgen picture but the results are disappointing. If after splintage and later active exercise there is no sign of improvement of the movements, then an early decision should be made as to whether amputation is advisable.

There were 185 fractures of the first metacarpal and of these 93 per cent were fractures of the base. There were 73 cases of Bennett's fracture, an outward subluxation of the base of the metacarpal with a triangular or comminuted fracture of the "head" which remains in its normal position at the base. It is essential in this fracture to maintain a position of extreme abduction and extension of the thumb. Malunion of these fractures results in severe osteoarthritis with disability. An easily applied method of treatment is to construct a wire frame in the manner of a Thomas splint and to incorporate this in a dorsal plaster cast which fixes the wrist joint. Traction is then made on the thumb and local pressure is applied over the base of the metacarpal by means of a felt pad. The period of fixation should be about six weeks.

There were 100 cases of fracture of the base of the thumb metacarpal not involving the joint. The untreated cases often heal with a backward angulation which may limit the abduction movements of the thumb. Early cases should be reduced under anesthesia and the position maintained by a dorsal plaster cast incorporating the thumb as far as the interphalangeal joint. The thumb is held in a position of abduction and extension. Fixation should last about four weeks.

There were 516 fractures of the other metacarpals. Fracture of the neck of the fifth metacarpal is very common and the deformity is one of posterior angulation with lateral deviation to one side or the other. Correction of the deformity in recent cases is easily accomplished but the position must be held by a dorsal plaster cast including the proximal phalanx of the affected finger. Traction is of no value.

Fractures of the shaft of the metacarpals most commonly involve the fourth and fifth. The deformity is usually only slight and is in the nature of shortening without much angular deformity. Errors in treatment are most commonly due to over-splintage or use of traction for a slight degree of shortening. In the ordinary case of fracture of the metacarpal, natural recovery proceeds quickly and functional disability of the hand is rarely seen. All that is necessary in the oblique fracture is a dorsal

plaster cast and early institution of finger movements. If there is angular deformity this is corrected by manipulation and by moulding the plaster closely over the dorsal surface of the injured metacarpal. The plaster may include the proximal phalanx of the injured finger. Finger movements should be encouraged to be full within a day or two and the patient will be ready for work in about four weeks.

HARVEY S. ALLEN, M.D.

Mallet-Guy, P.: Closed Reduction of Fractures of the Spine (Documents sur le traitement non sanglant des fractures du rachis) *Lyon chir.*, 1938, 35

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Mallet-Guy reports a follow-up study of 21 cases of fracture of the spine in which closed reduction was done by Boehler's method, first reported in 1936, and 15 new cases were treated and followed up since May, 1936.

In the first group there were 3 patients with fracture complicated by paraplegia; 2 of these patients have since died, in both the spinal-cord lesion was irreparable. There has been marked improvement in the condition of the third patient, with only a slight residual paralysis. Of 10 patients with recent fracture without paraplegia, the author has recently examined 8, and all but one of them are working without disability or pain. One still complains of pain and disability which is not, however, localized at the site of the fracture, the roentgenogram shows an excellent anatomical result. Of the other 2 patients, one reports an excellent result, the other complains of some pain, but the question of compensation is not settled in this case. In 5 patients in whom reduction of the fracture was not done till late, the follow-up study showed all of them to be working without functional disability, 3 occasionally have slight pain, but it does not interfere with their usual activities.

The 15 new cases most recently treated by the author include 2 cases of fracture with paraplegia, 9 cases of recent fracture of the thoracolumbar vertebrae, 1 case of old fracture in the thoracic region, and 3 cases of fracture of the cervical spine. These cases were treated by the author's method of closed reduction described in detail before the Société de Chirurgie de Lyon on May 27, 1937. In one of the cases of paraplegia, the symptoms persist, in the other, the paraplegia has entirely disappeared, the sphincter function is normal, and there is only a slight zone of perineal anesthesia. In the 9 cases of recent fracture in the thoracolumbar region, the results are good, all of the patients are practically free from symptoms and serious disability, most of them are working at their occupations. In the case of late fracture the result was also good, the patient has no pain, although pain was constant and often severe before reduction. Of the 3 cases of fracture of the cervical vertebrae, 1 with paralysis of the right brachial plexus is showing progressive improvement, a year and a half after the injury. In the 2 other cases the functional results are excellent and

there is no persistent pain one patient has occasional pain in turning the head quickly, the other a dysesthesia of the right index finger

The functional results have therefore been very satisfactory in this series in the fractures which were treated within the first fifteen days. In these cases the roentgenological examination usually showed a good anatomical result if the repair of the fracture was not perfect as could be demonstrated in some instances by placing the patient in the position of lordosis the enlargement of the neighboring vertebral discs practically corrected this and maintained the normal axis of the spine. In fractures treated one month or more after injury the functional results were often good but the fractured vertebrae showed definite anatomical abnormalities and the normal axis of the spine was maintained by the support of the neighboring vertebrae. ALICE M. BLEVINS

Watson Jones R. Dislocations and Fracture Dislocations of the Pelvis. *Brit J Surg*, 1918 2, 173

Isolated fractures of the pelvic ring include fracture of the body of the ilium, unilateral fracture of one or both pubic rami, and slight separation of the symphysis pubis. Wide displacement of the fragments does not occur. The fractures are treated by recumbency and the patient may lie in any position desired.

Combined fractures of the pubic segment of the pelvic ring may be unilateral fractures of the pubic rami with dislocation of the symphysis or bilateral fractures of both pubic rami. They are produced by lateral compression of the pelvis. There cannot be marked displacement of the fragments, alteration of the alignment of any weight bearing joint, or shortening of the lower extremities. The treatment is recumbency for from four to six weeks with the patient lying on his back. Lying on either side will increase the lateral compression.

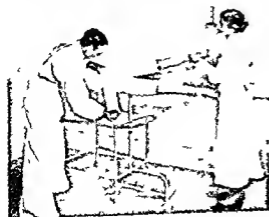


Fig. 1. The dislocated ilium is rotated forward and downward toward the uninjured side.

Combined fractures of the iliac and pubic segments of the pelvic ring may result in wide separation of the fragments, complete disruption of the pelvic rim deformity, and shortening. The common examples are dislocation of the symphysis with sacro-iliac dislocation and fracture of both pubic rami with sacro-iliac dislocation. These injuries are produced by forceful compression in the antero-posterior axis. The displacement is most easily corrected by manipulation under general anesthesia with the patient lying on the uninjured side. The reduction is maintained by a double short leg plaster hip spica. If the cast becomes loose a second plaster spica is applied in a similar manner. Immobilization is continued for three months. The patient should lie on the other side and not on his back. Periodic roentgenograms should be taken. The functional result depends upon accuracy of reduction of the sacro-iliac dislocation which is easily overlooked.

The displaced innominate bone is rotated on a longitudinal axis near the sacro-iliac joint. The dislocated half of the pelvis is swung outward and only secondarily, in the more severe cases, is it displaced upward. The weight of the lower extremity maintains the outward rotation. Any manipulative maneuver done with the patient lying on his back is made more difficult because gravity tends to keep the fragments rotated outward. Lay the patient on the uninjured side and the two halves of the pelvis fall together. In many cases the reduction is accomplished by the time the patient is in this position. It may be necessary to apply pressure over the crest of the dislocated ilium and push and rotate it downward and forward toward the normal half of the pelvis. When the pelvic disruption is complicated by rupture of the urethra, extravasation of urine or injury to the pelvic vessels, which interferes with active treatment of the bone and joint injury, simple lateral recumbency is the treatment recommended.

Eleven of the 18 patients with total disruption of the pelvis were treated by manipulation and plaster in lateral recumbency. There was 1 death; all the other patients made uneventful recoveries.

Six patients had old unreduced injuries. The striking feature of these cases was the constant complaint of aching pain in the sacro-iliac region when this joint was involved and the absence of symptoms other than shortening of the leg when the joint was uninjured. ROBERT P. MCGROVER, M.D.

Patti G. The Treatment of Fractures of the Neck of the Femur (*Indirizzo e metodica nella cura delle fratture del collo del femore*). *Chir. d. organi*, movimento 1935 23 399

The treatment of fractures of the neck of the femur is placed under two headings: (1) recent fractures and (2) old fractures.

A total of 698 cases of recent fracture has been treated at the Istituto Rizzoli from its foundation to 1937. Five hundred and twenty nine cases, or 75.78 per cent, were treated by the closed method. One hundred and sixty nine cases, or 24.22 per cent,

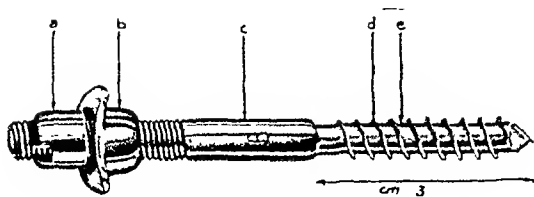


Fig 1 The Putti screw-bolt

were treated by open operation. The operative interventions were as follows:

Removal of the head—7 cases

Whitman reconstruction operation—2 cases

Transtrochanteric osteotomy—2 cases

Osteosynthesis with arthrotomy—8 cases

Blind pegging by transtrochanteric osteosynthesis—114 cases

Autogenous transplantation—5 cases

Osteosynthesis using stainless steel bolts—34 cases

In 3 cases there was more than one operation performed.

Putti uses a portable roentgen machine with two sets of tubes, one for the anterior position and the other for the lateral. These are adjusted before the operation begins. Repeated films can be taken without disturbance of the patient or moving of the machine during the operation.

A small developing tank which only requires the insertion of the hands is used in the operating room. In this manner the films can be rapidly developed and the course of the drill can be very carefully checked.

A heavy threaded screw bolt with a large nut is used to fix the fragments firmly together, and any possible slipping of the fragments is thereby avoided, and at the same time the fragments are firmly drawn together on the same principle as the nut and bolt used by mechanics.

Operation is advocated as soon as possible following the fracture, provided that the patient's condition permits it. Pre-operatively, the patient is placed in traction with abduction of 30 degrees and internal rotation. From 8 to 10 lbs of weight are required. The fracture is reduced prior to the operation.

The injured leg is placed on the operating table with 20 degrees flexion of the hip, abduction of 10 degrees with internal rotation, and flexion of 10 degrees.

A metal grid is placed over the hip and a film is exposed. The center of the head can be well localized. A colored dot is placed on the skin where the grid marks the center of the head, then the grid is removed.

From 30 to 40 c cm of 0.5-per-cent novocaine are used.

The Valls-Lagomarsino guide is now inserted into the center of the head and a check-up film is taken. Any adjustments which are necessary are made.

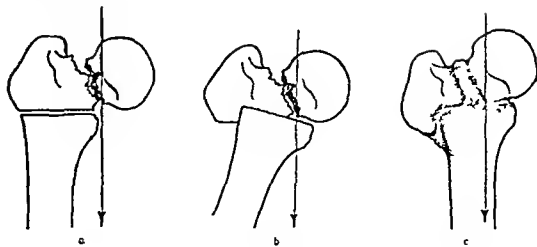


Fig 2 The three steps of an intertrochanteric osteotomy.

An incision 10 cm in length is then made over the trochanteric prominence and the bone is reached.

The size of the bolt to be used is determined by the number indicated on the guide.

A small drill hole is made all the way through, then a larger hole is made in the trochanteric fragment alone, so that the screw bolt slips through the proximal fragment without any effort.

The screw bolt is inserted until the head fragment is firmly fixed, then the nut is turned and the two fragments are pulled together.

The operative time is between twenty-five and thirty-five minutes.

Postoperatively, a cast which includes the pelvis and extends down to the knee on the affected side is applied. The patient is permitted to get up at the end of three or four weeks. The cast is bivalved at this time and physical therapy is started. No attempt at weight-bearing is permitted for at least two months after the operation, and then only gradually, with external support. The cast is taken off when union is shown roentgenographically.

The mortality was 12.1 per cent, there being four deaths. In 68 per cent of the cases there were excellent end-results, in 20 per cent, good results, and in 12 per cent, failures.

For old ununited fractures of the neck of the femur, the author advises an intertrochanteric osteotomy, and that the distal fragment be forced medially under the head with some abduction of the leg. This should be done under local anesthesia through a small lateral incision.

The leg must be kept in traction for at least a week prior to the operation in order that the shaft be pulled down so that when the osteotomy is done it will be below the level of the head and not above it.

The osteotomy must be done with care and precision, the cut being transverse to the long axis of the shaft.

This usually requires from fifteen to twenty minutes. The patient is placed in a cast including the pelvis and extending to the malleoli, with about 50 degrees of abduction and slight flexion of the hip and knee. This cast remains on from two to three months until some callus is evident around the osteotomy. Then the leg is brought into 30 degrees of abduction and a similar cast is applied. Immobilization is necessary for four or five months from the

time of operation. Twenty-one operations have been done with 19 successful results.

The value of the article is enhanced by beautiful and instructive illustrations. CARLO SCUDERI M D

Goff C W. Fresh Fracture of the Os Calcis. *Arch Surg*, 1938 36 744

An excellent historical review of the literature dating back to the year 1720 is included in this article and the illustrations present concisely the various methods of treating fractures of the os calcis since the year 1905.

The author treated 8 patients with fresh fracture of the os calcis by immediate reduction under gas oxygen anesthesia. This was accomplished by the use of a modified carpenter's clamp to which could be adapted wooden blocks of several sizes and shapes to aid in molding the fractured fragments back into their normal position. In this manner the lateral expansion of the fractured fragments was cared for.

In cases of avulsion of the upper tuberosity in which a fragment is pulled upward by the Achilles tendon along with plantar displacement of other fragments the bones are molded forcibly into position by application of the clamp at right angles to the first position described (Fig 2). After the displaced fragments are forced into position felt padding is then applied to the sole extending around the heel and up to the knee. A snugly fitting plaster cast is then adjusted from the toes to the upper part of the thigh the knee being slightly flexed and the foot in the position of slight talipes equinus. A walking iron is incorporated. At the end of the second week the encasement is cut away above the knee. The plaster is removed at the end of the tenth week and physical therapy is begun. Weight bearing is allowed at the end of the twelfth week. A longitudinal arch support made of firm felt or metal is used in the shoe.

The author's cases are explained in detail along with tracings made from the roentgenograms of the

fractures with lines drawn to illustrate the variety of tuber joint angles encountered.

The results of this treatment showed that 6 of the 8 patients made comparatively rapid recovery. This method is simple, effective and comfortable for the patient and removes the necessity of tenotomy. The more severe the fracture the more likely is spontaneous arthrodesis to occur and the more excellent the result if the reduction is complete. Old painful fractures call for a double or triple arthrodesis and occasional tenotomy may be necessary. An astragalectomy is never indicated. A restoration of the tuber ankle joint angle is essential. Closed reduction of a fresh fracture by forceful molding is recommended. The more recent writers report shorter periods of disability. Eight cases are reported in which closed forceful molding by means of a clamp and blocks was used.

RICHARD J. BENNETT JR. M D

Irwin C G. Fractures of the Metatarsals. *Proc Roy Soc Med Lond*, 1938 31 759

A series of 51 recent cases of fractured metatarsals is reviewed. The metatarsals are fractured by either direct or indirect trauma, the most common form of injury resulting from the dropping of some article on the foot or the mashing of the foot by the wheel of a vehicle. The indirect type which largely concerns the base of the fifth metatarsal is caused by a twist of the ankle or a shoe that is caught which causes the patient to fall forward and crack through the second and third metatarsals at their necks.

In the great majority of cases no reduction is necessary as the alignment is usually maintained. Many cases are difficult to diagnose even with the aid of the roentgen rays but the author stresses the importance of proper care of even a small crack of the metatarsal as neglect may lead to several months of difficult walking.

If the first metatarsal is fractured great care must be taken (1) to correct any impaction and (2) to be

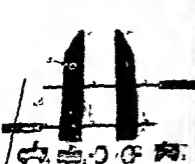


Fig 1



Fig 2



Fig 3

Fig 1. Clamp used in molding the fragments and reducing the fracture. 1 hemispherical blocks for lateral modeling. 2 oblong block used against plantar surface. 3 grooved block to fit around the attachment of the Achilles tendon over the tuberosity. 4 semilunar block used beneath the lateral malleolus and 5 holes through the jaws to carry

muslin ties to hold the clamp to the foot. Fig 2. The position in which blocks 2 and 3 are used to bring down the posterior tuberosity and raise the head of the os calcis. The clamp cannot get away from the foot because of the muslin ties. Fig 3. Application of the walking cast. manner of padding beneath the walking iron.

certain that any angulation shall not project toward the sole. Either of these complications would produce weight distribution on to the second or third metatarsal with serious complications to the transverse arch and mid-tarsal region. There is rarely much deformity when the middle metatarsals are fractured obliquely, and the first and fifth remain intact.

In the severe direct-violence injuries all the bones may be fractured. Early reduction is important. Attempts at manual reduction in these cases is usually futile and merely produces an increase of the damage to the soft parts. For these cases the author uses a general anesthetic. Wires are passed through the tips of the toes and traction is maintained against counter-traction at the ankle. Reduction of the fracture may be checked with the roentgen-rays and with the traction maintained the plaster cast is applied and carefully moulded to the arch of the foot. If there is a tendency for the displacement to recur an extension is added to the plaster and the wires are tied to it. The cast extends from below the head of the metatarsals to below the knee. As the swelling subsides the foot is replastered.

In simple cases the patient is encouraged to walk immediately. The author stresses the value of the walking-plaster as it produces the quickest result both in the healing of the bone and the maintenance of muscular and vascular tone.

The cast should be retained, even in simple crack fractures, for a month, and in more complicated cases from five to six weeks. After removal of the cast the patient is fitted with a transverse metatarsal strap and pad, while the inner side of the sole and the heel of the shoe are raised $\frac{1}{4}$ in.

In the 54 cases the average period that the patients were away from work on account of a fracture due

to indirect violence was eight and one-half weeks, and on account of a fracture due to direct violence, thirteen weeks.

HARVEY S ALLEN, M D

ORTHOPEDICS IN GENERAL

Cretin and Pouyanne: Action of a Graft of Elastic Tissue in Contact with Partially Resected Bone (L'action d'une greffe de tissu élastique au contact d'une résection osseuse partielle) *Mém l'Acad de chir*, Par, 1938, 64 709

Cretin and Pouyanne report an experiment in which a portion of the radius of a dog was resected, after the periosteum was stripped off. A segment of an artery with the endothelium removed was washed in physiological saline solution and inserted in the place of the resected bone, the periosteum was replaced over the arterial graft and sutured. In forty-five days the bone was found to be almost completely regenerated, only a thin layer of connective tissue and cartilage separated the advancing bony growth.

Examination of sections showed that the periosteum was very active, there was no trace of newly formed bone between it and the arterial graft. The elastic coat (tunica media) of the artery had undergone a definite transformation, first into cartilage, then into osteoid tissue and bone, where some of the elastic tissue elements were still discernible. The authors point out that the structure of the elastic coat of an artery is analogous to that of the periosteum. The periosteum contains elastic tissue elements, but these are minimal as compared with those of the tunica media of the artery. The mineral elements, calcium and phosphorus, pass through the periosteum, or its homologous structure, the artery, to be deposited in the pre-osseous tissue for the formation of bone.

ALICE M MEYERS

THE PRESENT STATUS OF THE MANAGEMENT OF VARICOSE VEINS

Collective Review

HERMAN O McPHEETERS MD FACS, Minneapolis Minnesota

ANY thesis on the management of varicose veins must of necessity discuss the development and evolution of that treatment as a proper background. This has been done so thoroughly and so often the past few years that I will make this review as brief as possible.

Early medical literature clearly proves that varicose veins were recognized as abnormal and as early as the first century they were thought to be the cause of ulcerations of the lower legs and feet. The efforts then as now were to dispose of the varicose veins. The first attempts were along surgical lines. The veins were transfixed (19) with stilets and sutures. Some workers used the hot caustery iron. The first recorded efforts at suture and tying off of the veins were by Celsus (44) who tied off the vein above an ulcer. Pare (44) did this again in 1579. Brodie (5) in 1846 very clearly understood the reverse flow in varicose veins and urged ligation of these veins but for some reason his theories and ideas were not accepted for it was left to Trendelenburg (58) in 1891 to imprint and associate his name with the tests and operation for their cure. Other prominent names associated with the development of this treatment are Schede (47) with his multiple division, Keller (25) with his wire stripping and Mayo (33) and Babcock (1) with their strippers. It was Schiassi (48) in 1908 and Homans (21, 22) in 1916 who first advocated the ligation of the saphenous vein at the saphenofemoral junction. It was from this time that real progress was made in the treatment of varicose veins.

Coincident with the development of the surgical treatment of varicose veins there were attempts by others to cure the condition by the injection of solutions directly into the vein lumen. The exact cause and method of obliteration was not known although the veins did thrombose and disappear in many cases.

The modern treatment of varicose veins is based on the results of both the operative and the injection treatments and today the combined high ligation and injection treatment is used by

most surgeons in all cases of extensive varicose veins of the lower extremities.

Schiassi (48) in 1908 was the first to use the combined treatment. He was the first to inject the solution into the distal segment at the time of ligation. Some say Tavel (55) did the same in 1904, but I believe he injected his solution at a later date.

Because the injection treatment alone is sufficient for all the smaller veins and is preferred by some for all varicose veins large and small, it is best that it be discussed first.

There are still a great variety of solutions used for this work and none as yet has been found that complies with all the requirements of the perfect solution. There is the occasional worker here and there who still prefers the 20 per cent salt solution while some prefer the salt and sugar mixtures. Sodium sacchylate has been forgotten although the French still use it to some extent. Quinine is still used a great deal in England, but it is not used as much in the United States as it was. Verovitz (59) thinks that the combination of quinine and sodium morrhuate is the ideal solution. Stapelmohr (52) uses a 65 per cent dextrose solution, although the majority of workers have given up the sugar preparations. Sodium morrhuate is used today by more physicians than any other solution. It is now prepared by all the pharmaceutical houses in the standard strengths of 5 and 10 per cent. The reactions seem to vary somewhat but are quite constant. Many cases of allergic reactions have been reported following its use. Some I feel sure were not anaphylactic but merely the psychic reaction so often seen in some patients. One fatality was reported in the *Journal of The American Medical Association* 1937 108 1822 under Notes and Queries. The author was not given. Gluck (15) Traub (57) Dale (6) McCastor (34) and Lewis (31) have all reported allergic responses and some have seemed to observe them quite often. These reactions are undoubtedly due to impurities in the product which perhaps has been made from an inferior grade of oil. They all seemed to have occurred following



Fig 1 Before treatment by ligation and injection



Fig 2 Three months following ligation and injection treatment

an injection performed after some period of time had elapsed since the previous injection. This I believe is over-exaggerated as I have used sodium morrhuate in several thousand injections over a period of several years and have never seen any serious reaction other than the urticaria. This urticaria has not occurred during the past two years. I never make any effort to test my patients for allergic response, whether they have been treated before or not, and use the dose suitable and indicated for the individual and varix being treated. Many of the reported cases were over-treated, in my opinion, with entirely too large doses into one varix in the calf. I still use the tourniquets in an effort to localize the injected solution and it may be that they retard the rate of absorption and thus minimize the allergic response. Sodium ricinoleate is very effective and preferred by many, and a new preparation of monolate is giving fine results. Sodium linoleate is good and would seem to be free from the possibility of allergic reaction.

In the majority of cases in which the great saphenous vein at the foramen ovale is size 3

or larger, there will be a recurrence of the varicose vein due to recanalization. It is for this reason that the combined high ligation and injection treatment has become accepted today as the proper method of treatment of any extensive case of varicose veins with a marked reverse flow (Figs 1 and 2). This combined method is used by such an array of workers as Haggard (16), Lahey (54), Ochsner (41), Zimmerman (62), Johnson, G. S. (23), Johnston, C. H. (24), Hawkes (17), Lowenberg (32), Willauer (61), Swinton (54), Edwards (9), Faxon (13), and the writer. Kilbourne (27) disagreed and said that "history has proven it a failure the same as with other surgery for varicose veins." He used the injection treatment alone. In the entire American literature I have been unable to find a record of a single fatality following the combined ligation and injection treatment although Westerborn from Sweden reports a mortality of 0.33 per cent in 1,200 cases treated in this way. This is hard to explain except that his patients may have been kept in bed for some time after the operation, while we, in this country, have the patient get off the operating table and



Fig. 3 Extensive varicose veins of the leg seen at the eighth month of gestation. These can be easily treated with the relief of much pain and discomfort when seen about the fifth month. (Courtesy of Dr. C. R. Wall, Minneapolis, Minn.)

walk. Personally, I have my patients up and walking every two hours. In no case have I ever had a sign that might point to a pulmonary embolus.

Some workers prefer to ligate *only* at the time of the operation (17) while others go to the other extreme and do a bilateral ligation with injection of both distal segments at the same time. The ligation is distinctly a surgical procedure and should be done *only* in the operating room, as any surgery. Any of the solutions may be and are used for the injection with the ligation. Some workers prefer to wait one week after the ligation before they make any injections. This is entirely a matter of personal judgment.

When there are complications in the lower leg, as ulcers and eczemas secondary to the presence of the varicose veins, most workers prefer to use the supportive therapy until the case is under control and then ligate and inject the solution as in any other case. With this I fully agree. Sarma (46) advises that the ulcer be healed before ligation is done. He says he has often had a thrombus

form in the proximal segment. If the ligation was done at the saphenofemoral junction there would be no proximal segment left, therefore he has ligated too low. The early ligation will hasten the healing of the ulcer. Owens (43) urges that excision of the dense scar tissue of the old recurrent ulcer area be followed immediately by the application of a pedicled flap or a full thickness skin graft. He has much evidence and experience to confirm his opinion. Faxon (13) advises the undercutting of the ulcer area with excision and skin grafting. In other cases he suggests a wide undercutting so that any bed of veins under the ulcer may be broken up and then that the area be sewed back again as a true skin flap. Stapelmoht (52) excises the ulcer and scar area and then applies a Thiersch graft. Douglas (7, 8) advises excision of the ulcer and scar area and the immediate application of his sieve grafts. Personally, I believe we should excise far more areas of recurrent ulcerations and scar tissue about the lower leg than we do, for new skin well grafted on a good bed will stand much more trauma than the paper like covering over a healed ulcer. Stern (53) uses a 5 per cent alcoholic solution of gentian violet which he applies over the ulcer three times a day. This he follows with a drying dusting powder. Thurmon (56) uses pure gentian violet crystals in a 2 per cent aqueous solution. This is also applied three times a day and left uncovered to dry. Some think the ultraviolet light is of much help. Eskinow (12) uses it for both varicose ulcers and eczemas. During the past two years much has been done with the use of iontophoresis in the treatment of varicose ulcers. Kovace (28, 29) and Murphy (38) have reported ideal results.

The fungus infection associated with the secondary extensive weeping eczema and dermatitis so often seen with ringworm infection of the feet is markedly aggravated by the presence of large varicose veins. The latter should be treated just the same as in any other case. Rusten believes that most of the skin reaction is allergic in nature and secondary to products formed and liberated in the original infected area. The best results are obtained when the patient is put to bed with the lower leg in high elevation and in packs saturated with Burrows solution diluted 1 to 10 with cool water. Small amounts should be applied every half hour so as to keep the few layers of gauze continually wet. The application of a 5 per cent alcoholic solution of gentian violet or any good antiseptic over the area of the active course of the fungus is correct and should be done twice a day. After the weeping has stopped, applications of zinc oxide and olive oil are commonly used over



Fig 4 Left, Extensive case of varicose veins complicating pregnancy. Patient quintipara, seven months pregnant. Note the extensive varices in the labia. The patient was practically an invalid from the pain in the labia and leg. Right, Same case three weeks later following treatment with 75 per cent invert sugar (Varitose). Patient was comfortable throughout the last five weeks of her pregnancy.

the recently inflamed areas. All of the patients recover more quickly if the period of bed rest is lengthened at first. Following this the patient must have support for a long time.

Infectious thrombophlebitis has received much attention the past year (36). Edwards (10) has done much experimental work on it showing the destruction of the venous valves and how this may be the first step in the development of varicose veins. The general subject has been discussed in all its phases. Most workers still use conservative treatment with hot wet packs and the leg in elevation. Others advise radical ligation proximal to the thrombus (2, 4, 22, 39).

Varicose veins often complicate pregnancy and may cause so much pain and distress that the patient is made an invalid during the last two months of the term (Fig 3). It is true that most of these varicose veins will disappear spontaneously following confinement. Even so, many writers (33, 50) advise injection for severe distress even though the condition may return when the patient is up and about (Fig 4).

The fine, superficial bursts and spider flares (Fig 5) can be treated by the use of $\frac{1}{2}$ per cent soricin or 1 per cent sodium morrhuate. Extreme pressure should be applied immediately following treatment and the veins held collapsed by use of an elastoplast bandage over gauze compresses. This bandage should be left on for from four to six days. Of course the large varicose veins associated with and feeding the bursts must be treated with the usual solution and in the usual manner.



Fig 5 An extensive case of superficial bursts or fine cutaneous veins. The feeder veins can be seen very clearly. A good result was obtained following preliminary high ligation and the injection of 5 c cm. of 5-per-cent sodium morrhuate distally at the time, the lower leg being kept bandaged. The bursts of the lower leg were later injected with 1-per-cent sodium morrhuate. (Case of Dr A. F. Bratrud.)

CONCLUSIONS

After a most thorough survey of the literature up to April 1938, I would say that the present status of the management of varicose veins can be stated as follows:

1. The injection treatment of varicose veins has been universally accepted.
2. Sodium morrhuate is used more widely than any other solution.
3. Other good and effective solutions are: monolate, soricin, sodium linsolate, moruquin and potassium oleate. There are probably many others that I have not used.
4. The combination of high ligation and subsequent injection, either immediate or delayed, is a distinct advance in the treatment of varicose veins and their complications.
5. This treatment is a surgical procedure and must be undertaken as such.

6 The majority of workers make at least part of the injections at the time of operation through the distal segment

7 More caution is being exercised with regard to overtreatment of the individual case which is easily done. Not more than 2 ccm should be given into any varix in the lower leg at one time unless scattered injections are made

8 More attention is being paid to the varicose veins when associated with extensive eczema and ulcerations of the lower leg

9 More operators emphasize that the high ligation be done at the saphenofemoral junction than formerly. If the ligation is done at that point there will be no proximal segment, and therefore a proximal thrombus formation cannot take place

10 The American surgeons make the treatment of varicose veins an ambulatory procedure and most of them have their patients up and walking immediately following the operation and injections

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SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

De Takats, G.: *Vascular Accidents of the Extremities* *J Am M Ass*, 1938, 110 1075

Vascular accidents of the extremities are ordinarily first seen by the general practitioner, and early recognition and early simple treatment may be the deciding factors in the ultimate outcome of the emergency.

Arterial hemorrhage may be due to clean cuts or to crushing injuries of the vessels. In the latter instance large sections of the vessels may suffer from reflex spasm and this spasm may extend to the collateral vessels. Treatment of the spasm is important. In the case of medium and large-sized vessels, the bleeding cannot be controlled with simple packing, but the vessel should be doubly ligated and severed, and the stump transfixed. If the distal stump does not show pulsation, the accompanying vein should also be ligated. As soon as the injury has healed, all measures known to increase the collateral circulation must be employed. Otherwise severe contractions and atrophies ensue.

The differential diagnosis between arterial embolism and thrombosis may be very difficult. In spite of all that has been said recently of conservative measures to increase the circulation, the extraction of the clot is still the optimal treatment. To be of value this should be done within ten hours. Conservative measures should be carried out from the start. These include the use of a heat cradle, lowering of the limb from 10 to 15 degrees, and the injection of a potent vasodilator, 0.03 gm. of papaverine. If conservative measures have not been successful, embolectomy should be performed at a time when it will still be of some value. "The technic of arterial suture can be learned by anyone who can undertake to suture an injured or perforated bowel."

In arterial thrombosis the conservative methods used in the case of arterial embolism should be used. In some cases the thrombosed segment keeps up a reflex spasm of the remaining vessels of the leg and should be excised.

Venous thromboses of the lower legs are divided into four groups: (1) spontaneous thrombosis of the superficial but not varicose veins (Buerger's disease frequently ensues), (2) thrombophlebitis of the varicose veins, (3) thrombophlebitis of the deep veins with typical lymphedema, and (4) thrombophlebitis of the deep perforating veins, which is frequently fatal.

In the treatment of deep thrombophlebitis, one must combat embolism, ascending thrombosis, and persistent edema. The treatment consists primarily of rest, elevation of the limb, and the application of heat. In patients with pulmonary embolism, oxygen and 0.03 gm. of papaverine should be given and if

the blood pressure falls below 90 mm Hg, its cautious elevation with ephedrin or neo-synephrin should be attempted. To prevent future persistent edema from forming, treatment should be begun early. It consists of restriction of fluid intake to 1,000 c cm. per day, restriction of the salt intake, administration of ammonium chloride and salyrgan, and the use of the heat cradle and of elastic bandages on the limb. JOHN WILTSIE EPTON, M D

Tucker, J.: *The Diagnosis and Treatment of Peripheral Vascular Disease*. *Med Clin North Am*, 1938, 22 459

Three main factors are responsible for most of the disturbances in the peripheral circulation: (1) excessive and prolonged vasospasm, (2) inflammation of the vessel walls, and (3) degenerative vascular changes due to the wear and tear of life.

In brief, the various agents that influence the tone of the capillaries may be classified as either vasodilators or vasoconstrictors.

1 Vasodilators

- a Tissue metabolites formed during muscular work, carbon dioxide and increased hydrogen-ion concentration
- b Tissue extracts: histamine which produces capillary paralysis and increased permeability, choline, which stimulates the vagus nerve, diminishes cardiac activity, and produces peripheral dilatation, adenylic acid which slows the heart, and effects vasodilatation
- c Vasodilator nerves, via the posterior roots, with centers in the posterior root ganglia
- d Heat, locally, which may liberate acetylcholine

2 Vasoconstrictors

- a Pressor substances: adrenalin, pituitrin, and unknown physicochemical substances
- b The sympathetic nervous system
- c Cold, locally

Both effects, whether of constriction or relaxation, are controlled through the vasomotor center. Pain, heat, cold, traumatic shock, and emotions may modify the tone of the capillaries.

In clinical practice, we must differentiate between functional and organic disturbances of the circulation. A careful history should be elicited, and a general as well as a local examination must be made.

Diagnostic measures include:

- 1. Inspection of the extremities: the significance of postural color changes and ulceration and gangrene are discussed
- 2. Palpation: the temperature of the extremity and the presence or absence of the normal pulses must be determined. Reich has shown that, in normal people, the dorsalis pedis pulsation is absent in 4 per cent and abnormally placed in

8 per cent of all the patients. The posterior tibial artery is found to be absent in 5 per cent of all patients.

3 More elaborate methods of determining the condition of the circulation in the extremities include

- a Surface temperature readings by the electric thermocouple
- b Determination of the degree of skin vaso dilatation by the histamine wheal test
- c The determination whether the peripheral vascular disease is due to organic vascular obstruction or in greater or lesser degree to vasoconstriction
 - (1) Spinal anesthesia
 - (2) Peripheral nerve block
 - (3) Increase in the internal production of heat (typhoid vaccine hyperpyrexia)
- d Arteriography

The author outlines in detail the points of differential diagnosis between the following organic and functional vasospastic diseases of the peripheral vascular system

- 1 Organic lesions
 - a Thrombo-angitis obliterans
 - b Arteriosclerotic gangrene
 - c Arterial embolism
 - d Latent phlebitis
- 2 Functional vasospastic diseases
 - a Raynaud's disease
 - b Erythromelalgia (Weir Mitchell's disease)
 - c Acrocyanosis

Under treatment the following points are discussed

- 1 Medical therapy
 - a Specific measures
 - b Foci of infection
 - c Measures to avoid amputation of the affected extremity
 - d General measures
 - e Tissue extracts
 - f Drugs
 - 1 Alcohol
 - 2 Compounds of theobromine
 - 3 Papaverine
 - g Passive vascular exercise
- 2 Surgical therapy
 - a To improve impaired circulation
 - (1) Vein ligation
 - (2) Arterial ligation
 - (3) Arterial excision
 - (4) Periaarterial sympathectomy
 - (5) Sympathetic ramisection
 - (6) Sympathetic ganglionectomy
 - b To alleviate pain
 - (1) Peripheral nerve block
 - (2) Paravertebral block
 - (3) Intraspinal alcohol
 - (4) Chordotomy (spinothalamic tracts)
 - c To remove non viable parts especially in arteriosclerotic and diabetic gangrene

JOHN H. GARLOCK, M.D.

Faxon H. H. and Barrow D. W. The End Results of High Ligation and Injection in the Treatment of Varicose Veins. *Surgery* 1938 3 518

The authors give a detailed account of their mode of treatment of varicose veins covering a report of some 367 operations in selected cases in which 1,072 extremities were treated. Their treatment of varicose veins consists of high ligation and subsequent injections whenever incompetence in the valves of the main saphenous trunk in the thigh can be demonstrated. To determine the presence or absence of incompetent valves in the main trunk the authors relied upon the findings of the Trendelenburg test and the Schwartz test as originally described by Chevrnier.

The feature of utmost importance in the high ligation of the long saphenous vein is that it be carried out at the junction of the saphenous vein with the femoral vein. In their earlier cases in which high ligation was carried out at a lower level results proved this to be faulty operative technique. The authors point out that when in these early cases the operation had to be done a second time, the second operation proved most instructive in that it showed the extent of the collateral circulation which rapidly develops if any proximal saphenous stump is left behind at the original operation. The authors stress the importance of visualization of the anterior surface of the femoral vein at the time of operation in order that the ligature be placed at the proper level. Almost equally important is the separate division and ligation of at least the three highest branches of the saphenous vein, together with an excision of 2 cm. of the main trunk below the ligation.

Contra indication to this procedure is apparent only in those cases in which the superficial veins compensate for a deep circulation that has been impaired by a previous phlebitis in those showing active inflammation in the groin and in those in which hemolytic streptococci are demonstrable in a complicating ulcer. The authors point out that the operation of high ligation carries with it a small but definite risk of major wound sepsis (about 2 per cent) and of pulmonary emboli (about 0.3 per cent).

The operation represents but one phase of the first step in the treatment of varicose veins. In order to obtain the best results it is essential that there be an adequate series of postoperative injections into all unthrombosed veins. These injections are made with quinine hydrochloride and urethane. Their purpose is to obliterate all unthrombosed veins.

Other adjuncts in the treatment of varicose veins became apparent in the intensive study that the authors carried out. A definite though rather small percentage of the cases showed incompetence in the valves of the communicating branches between the deep and the superficial venous systems of sufficient degree to jeopardize the results in treatment unless some step beyond high ligation and injection was carried out. Usually these cases gave a history of

previous deep phlebitis. Direct operative approach is the only effective method of correcting the abnormal venous flow found in grossly incompetent perforating branches. This is done by securing and dividing these communicating branches.

Another relatively small group of cases showed involvement of the short saphenous system in conjunction with varicosities of the long saphenous vein. In the treatment of these cases, ligation of the short saphenous vein in the popliteal space was carried out when this main trunk was shown to have incompetent valves. The authors contend that ligation at the popliteal vein should be done on the same basis and with an observance of the same general principles that high ligation is carried out in the groin.

In order that there be complete uniformity in the evaluation of all cases, the authors secured a very careful checkup of all patients. The period of one and one-half years represents the minimal period of time since the patient's operation, while two and nine-tenths years represents the average time since high ligation. The end-result rating in 367 operations of high ligation in selected cases, carried out in conjunction with postoperative injections of varicosities, showed perfect results in 55 per cent of the cases, satisfactory results in 25 per cent, and failures in 20 per cent. The chief factors responsible for the recurrences in the group of failures were: faulty operative technique in 39 per cent, complicating incompetent communicating branches in 46 per cent, involvement of the short saphenous system in 4 per cent, and the improper selection of cases in 3 per cent.

The incidence of recurrence depends primarily on the success of the original evaluation and treatment of the cases rather than on the elapsed period from the time of treatment. Moreover, the authors point out that age, sex, the presence of bilateral varicosities, and the extent of thrombosis following operation play no significant rôle in the ultimate success or failure of treatment, also, that retrograde injection with a sclerosing solution of the distal segment of the vein at the time of operation, before the vein is tied off, makes no significant difference in the end-result rating, although it does apparently decrease the number of injections required after operation. **MATHIAS J SEIFERT, M D**

Huet, P. A. Tumors of the Vascular Sheaths, with Special Reference to Those of the Popliteal Vessels (*Tumeurs des gaines vasculaires en particulier celles des vaisseaux poplités*) *J de chir*, 1938, 51 641

Huet observed a lipoma of the sheath of the femoral vessels and 2 fibrosarcomas of the sheath of the popliteal vessels in three women, fifty-five, thirty-three, and sixty-one years of age, respectively. He also reports an observation of Hartmann concerning a forty-one-year-old man with a myxoma extending from the head of the peroneal muscle downward for a distance of about 11 cm.

In the author's 3 cases the onset dated back to four, ten, and twelve years, respectively, without causing any noteworthy symptoms. There was absence of pain, no sign of vascular compression, and no articular reaction followed although one of the fibrosarcomas weighed as much as 1,300 gm.

On histological examination the tumors presented a very complex structure. The 2 fibrosarcomas showed definite signs of malignancy. One of them had recurred within a period of five years. In spite of their malignant character, the tumors showed a definite plane of cleavage and did not invade neighboring structures.

On the basis of these findings, Huet believes that these fibrosarcomas had originated in the popliteal fossa and, more specifically, in the vascular sheath of the popliteal vessels rather than in muscle tissue.

Macroscopical examination revealed that (1) the tumors were surrounded by a thin envelope, (2) there was no continuity with the tendons of neighboring muscles, (3) there was evidence of development within the neurovascular sheath with dissociation of its contents, (4) the tumors were anatomically related to a region normally occupied by large blood vessels; (5) they were fixed or movable according to the thickness of the sheath, and (6) there were neoplastic prolongations in the direction of the vascular bundles.

After briefly reviewing the literature on this subject, the author discusses some of the essential features of these neoplasms. Tumors of the vascular sheaths are often malignant but their malignancy is relatively limited in that they may attain a large size without invading the neighboring structures. They always seem to remain cleavable and do not produce pressure symptoms. However, in an early stage, circulatory disturbances may be observed. The tumors recur frequently. In general, it may be stated that the degree of malignancy of these tumors varies greatly from case to case.

Concerning treatment, the author believes that early amputation of the extremity is rarely indicated because these tumors do not tend to become generalized. He suggests that they be removed surgically and the patient be re-operated upon if recurrences appear. Radium therapy, applied post-operatively, yields only temporary results and is of little, if any, value in preventing recurrence.

RICHARD E. SOMMA, M D

BLOOD; TRANSFUSION

DeGowin, E. L. Grave Sequelæ of Blood Transfusions; A Clinical Study of 13 Cases Occurring in 3,500 Blood Transfusions *Ann Int Med*, 1938, 2 1777

Renal insufficiency has long been known to occur in hemolytic blood transfusions as well as in other conditions in which hemoglobinemia occurs. The various theories accounting for this reaction are not sufficient to explain the phenomenon. Not enough pathological evidence has been found in the human

kidney to warrant the belief that blocking of the tubules causes the nephritis. Chemical studies do not support the belief that the loss of chlorides has any bearing on the condition. The urticarial nature of the cause seems to be made invalid by the reproduction of the syndrome in dogs with a single transfusion. There is no experimental proof that the hemolysis releases some nephrotoxic substance. The vasoconstrictor action of hemoglobin on the kidney vessels may be a factor in producing renal ischemia but this hypothesis has yet to be confirmed with more experimental work.

Most of these reactions, some of which have been reported elsewhere, are due to grossly incompatible blood, but some of the cases in the present series show no incompatibility of the bloods by the present laboratory methods. Hemoglobinuria does not necessarily follow hemoglobinemia, the latter must be checked by the examination of the blood serum for signs of hemolysis from one to two hours following the transfusion. Seven cases of renal insufficiency with 6 deaths are reported. In one case there was an adenocarcinoma of the cervix in another a bleeding peptic ulcer in a third pernicious anemia in a fourth uterine fibroids, and in the fifth an intracranial operation and in only 2 cases were there pre-existing kidney lesions (1 pyelonephritis and 1 chronic glomerulonephritis). The transfusions were accompanied by or immediately followed by a febrile reaction, some by chills, cyanosis and dyspnea. In the ensuing days there was a gradual rise in the blood urea nitrogen values, uric acid and creatinine, and a marked oliguria or anuria occurred. Most of the cases had a high direct or indirect Van den Bergh reaction. Nausea and vomiting were

prominent and the other common signs of uremia were usually present.

Treatment is not specific despite the many reported remedies which have benefited isolated cases. The one recovery in this series was believed to be a spontaneous one despite the therapy rendered rather than the result of the therapy. The one beneficial prophylactic measure suggested is the pre-hummary alkalinization of the urine to prevent precipitation of hemoglobin in the kidneys. This has been shown to protect the kidneys in dogs. Proof for the human being is lacking as yet.

Three cases of hemolytic reaction with an increased Van den Bergh reaction with fever were reported following transfusions in which no signs of renal insufficiency developed. In 2 of these there was no demonstrable incompatibility of the bloods. In 1 the donor was of the universal type while the recipient was of Group AB.

Two cases of pulmonary edema are reported following transfusions in which no incompatibility was shown. Both patients died within a few hours after the transfusion.

Two cases in which retinal hemorrhage occurred following transfusion are reported. One of the patients had a nephritic condition with pre-existing hemorrhage; the other had the transfusion outside of the hospital and it was not known whether the hemorrhage followed the transfusion or was present beforehand.

The author stresses the fact that the transfusion should always be stopped when any symptoms of a reaction occur. He also emphasizes the importance of carefully matching and typing the bloods before transfusion.

THOMAS C. DOUGLASS, M.D.

SURGICAL TECHNIQUE

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Ives, H. R., Jr., and Hirschfeld, J. W.: *The Bacterial Flora of Clean Surgical Wounds. Ann. Surg.*, 1938, 107: 607.

A review of the literature reveals the fact that infection occurs in 5 per cent of all clean surgical wounds. Because of this the authors have made a study of the bacteriology of clean surgical wounds to determine its importance in relation to the problem of wound infections.

They took a culture of the air in the operating room during the course of operations. Cultures were taken also of: (1) the skin after its incision; (2) the region of the anterior fascia; (3) the parietal and visceral peritoneum immediately after opening of the abdomen; (4) the parietal and visceral peritoneum immediately before closure of the abdomen; (5) the anterior fascia; and (6) the line of incision of the skin.

In a part of the authors' series, cultures were taken to determine the number, rather than the type, of bacteria, and although large numbers of bacteria were found, the results obtained were disappointing.

After periods of twenty-four and forty eight hours the cultures were examined and transplants were made, if necessary. The media used were routine meat infusions of broth and tubes of cooked meat. Solid media consisted of meat-infusion agar plates, blood agar plates, and plain meat-infusion agar. When identification by colony type was impossible or doubtful, smears from the colonies were made and stained by Gram's method.

Studies were made only of cases which were free from contamination with feces, pus, urine, or bile. Preparation of the skin consisted of several washings with sterile liquid soap and water, then with a 70 per cent solution of alcohol, and finally several coats of kalmerid were applied. Positive cultures were obtained from the skin in 86 per cent of the cases at the start of operation, and in 100 per cent of the cases at the close of operation. Cultures positive for staphylococci were noted in 80 per cent of the cases at the start, and in 100 per cent of the cases at the close of operation, which indicates that the skin is far from sterile at the beginning of the operation and is heavily contaminated at its termination.

Positive cultures were obtained from the fascia in 41 per cent of the cases at the start, and in 82 per cent of the cases at the close of operation, which indicates that the number of organisms in the wound increases and that the fascial layer is heavily contaminated.

The total number of positive cultures of the peritoneum at the start amounted to 61 per cent, and at the close, to 90 per cent.

The percentage of cultures positive for staphylococci is shown to be as follows:

Skin	at start	80 per cent
	at close	100 per cent
Fascia	at start	38 per cent
	at close	76 per cent
Peritoneum	at start	16 per cent
	at close	93 per cent

Many of the organisms come from the skin, but it is believed that the majority come from the atmosphere and fall directly into the wound, or are carried there by sponges, hands, solutions, or other material that has been exposed to the air. The results noted in the cultures which were exposed to the air of the operating room showed that the various types of staphylococci constituted the majority of organisms recovered, i.e., 88 per cent.

It is right to assume that the contamination of wounds with the staphylococcus is the cause of many postoperative infections. The authors review the subject of wound infection, including all wounds closed without drainage. During a period of three years they observed 72 infected wounds. Upon culture, 54 per cent of these yielded staphylococci alone, which figure agrees with that of other investigators who have found the staphylococci to be the cause of 50 per cent of all wound infections.

Any improvement in surgical technique which will decrease the contamination of operative wounds by bacteria from the air, or from the skin of the patient, should result in a decrease in the incidence of post-operative wound infections. HARVEY S. ALLEN, M.D.

Davis, J. S.: *The Use of Relaxation Incisions When Dealing with Scars. Pennsylvania M. J.*, 1938, 11: 595

The author states that the relaxation incision is a very old procedure, as even Celsus mentions it in his writings. He points out the usefulness of the procedure in the treatment of old scars that are interfering with function and are therefore under tension, and states that scars cannot always be treated by the ideal method, i.e., excision.

Consideration is given to three ordinary types of scar. (1) the large, contracted, thick, adherent scar which may or may not interfere with function, and in which may be one or more unhealed areas; (2) the unstable type of scar which is difficult to heal and, when healed, frequently breaks down; (3) the contracted type of scar with binding bridges or webs.

When the author treats these scars, he prefers the patient to be in good general physical condition. He uses avertin as a basal anesthetic, supplemented by N_2O and O_2 , after which he prepares the skin with ether, alcohol, and a solution of potassiummercuric iodide (4 gm. in 460 c.c.m. of acetone). If a

kidney to warrant the belief that blocking of the tubules causes the nephritis. Chemical studies do not support the belief that the loss of chlorides has any bearing on the condition. The urticarial nature of the cause seems to be made invalid by the reproduction of the syndrome in dogs with a single transfusion. There is no experimental proof that the hemolysis releases some nephrotoxic substance. The vasoconstrictor action of hemoglobin on the kidney vessels may be a factor in producing renal ischemia but this hypothesis has yet to be confirmed with more experimental work.

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THOMAS C. DOUGLASS, M.D.

SURGICAL TECHNIQUE

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Positive cultures were obtained from the fascia in 44 per cent of the cases at the start, and in 82 per cent of the cases at the close of operation, which indicates that the number of organisms in the wound increases and that the fascial layer is heavily contaminated.

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When the author treats these scars, he prefers the patient to be in good general physical condition. He uses avertin as a basal anesthetic, supplemented by N₂O and O₂, after which he prepares the skin with ether, alcohol, and a solution of potassiummercuric iodide (4 gm in 460 c cm of acetone). If a

chronic ulcer is to be excised he swabs it thoroughly with phenol

In the large thick contracted scar which defies excision the most binding portion of the scar is located and the proposed incision line is mapped out transversely across that portion with brilliant green. Other similar areas are treated in the same way. The scar is then divided through its full depth to normal tissue. If the scar is very thick then a wedge shaped slice can be taken out of the entire length on each side and the thin outer surface edges may be drawn down to the normal base by a few Y sutures of horsehair. This will make subsequent grafting easier. While these incisions may be made in any direction according to the pull of the scar in the extremities it is better if they parallel the long axis of the extremity.

The procedure may have to be done in stages as much as possible being gained with each one. The stages should be followed by massage and other physiotherapy.

If the blood supply permits a graft of the Ollier Thiersch type may be applied. However grafting may have to be put off until adequate granulation tissue is formed. The author gives a detailed description of the type of dressing to be used.

The unstable scar occurs most frequently in extensive loss of tissue and the skull and extremities are most often affected. Before they are treated it is best to have them entirely healed. If this is not possible then with proper sterilization the bacterial count may be so lowered that it is comparatively safe to proceed. The incisions should extend into the normal tissue outside of the scar and down to the deep fascia. There is usually a wide gaping of the wound and these gaps are dressed as are the wounds of the thick contracted scar. As before, skin grafting may be done immediately or after the subsequent development of granulation tissue.

By the utilization of the Z shaped or modified Z shaped relaxation incisions flaps of scar tissue or tissue that is infiltrated with scar may be used for the relief of binding scar contractures. This type was first used by Denonvilliers in 1856. The contracted scar with binding bridges or webs is usually located where the extremities join the trunk as in the axilla and also on the face and neck. It is usually best to delay operative treatment on these scars for at least six months after healing and during this time massage and passive motion can be used. The author emphasizes that the point of the Z incisions should be blunt and that in the handling of the flaps made by undercutting hooks should be used so that there is no bruising of the tissue. Also some subcutaneous tissue should be brought up with the flap to give it a good blood supply. The central line of the Z incision should be over the most prominent part of the scar and in the grooved scar the central line should split the groove lengthwise.

In some instances relaxation may be obtained if an opening is burrowed completely under the scar and strips or tubes of whole thickness skin are

implanted. After two weeks have elapsed the scar above the graft is incised it will gape widely relax the scar itself and leave a skin graft in the bottom of the defect.

The author emphasizes that in all of these conditions the scar tissue or skin infiltrated with scar is utilized. Furthermore the hastening of healing of the relaxation defects by skin grafting or flap lifting is a secondary measure as healing would be unsuccessful were it not for the relaxation of the scar.

ALTON OCHSNER, M.D.

ANESTHESIA

O'Brien J. D. and Steegmann A. T. Severe Degeneration of the Brain Following Nitrous Oxide Oxygen Anesthesia. *Ann Surg* 1935 107 456

The authors report the clinical and autopsy findings in a patient who suffered a postanesthetic encephalopathy and lived sixteen months thereafter. The patient a white female of thirty one was given a nitrous oxide oxygen anesthetic for the removal of a bladder papilloma transcystoscopically. During the anesthetic administration there was no evidence of any unusual reaction. The patient did not awaken from her anesthesia for eight or nine hours when she had maniacal behavior interrupting the coma from which she failed to return to a conscious type of mental activity. Five days later she developed generalized muscular twitchings and five months later she presented the typical picture of decerebrate rigidity. She had a remittent type of fever which would vary from 102 to 106° F for several weeks and then she would remain normal for a time. The spinal fluid was examined many times and consistently showed a pressure of about 250 mm of water but otherwise was negative. The blood findings were normal with the exception of a moderate leucocytosis. Death occurred suddenly sixteen months following the operation.

Pneumonia was given for a head autopsy only. This revealed a massive subdural hematoma 1 mm in thickness which covered all of the dura. The brain weighed only 900 gm after formalin fixation. The histological picture was one of marked degeneration of the ischemic type affecting especially the third and fourth cortical layers. The ganglion cells were either entirely gone or shrunken. The authors believe that the cellular changes were those of anoxemia but the exact type or origin was not evident. The process was entirely degenerative and not associated with any inflammation or previous vascular damage. They do not believe that there had been any specific predisposition since the patient in question had had a previous nitrous oxide oxygen anesthetic. There were no evidences of previous generalized or cerebral disease. The authors do not believe that any relation hip can be shown in this case to an abnormal carotid sinus reflex. They suggest that there may have been a local vulnerability of the brain in this particular case.

but leave the consideration of this to a future publication

WILLIAM C. BECK, M.D.

Gebauer, P. W., and Coleman, F. P.: Postanesthetic Encephalopathy Following Cyclopropane. *Ann Surg*, 1938, 107: 481

The authors report a case of degenerative changes in the brain following cyclopropane anesthesia. The patient, a white female of twenty-nine years, was subjected to a first-stage thoracoplasty for pulmonary tuberculosis. Cyclopropane was administered by the carbon-dioxide-absorption technique. The condition of the patient during the operation was good. Twenty-four hours after the operation the patient vomited, and thirty-six hours after, she had a convulsion and became comatose. The fever rose continuously and she became cyanotic and remained so, even in the face of the continuous administration of oxygen. There was a slight hemoglobinuria and the skin assumed a subicteric tint. The patient soon assumed the picture of decortication with meningeal irritation. The blood and spinal fluid findings were essentially negative. The patient died seven days and six hours postoperatively.

Autopsy revealed pulmonary tuberculosis, with hemorrhagic erosion of the gastric mucosa, acute ulceration of the urinary bladder, and passive hyperemia of the kidneys. Grossly the brain was normal as were hematoxylin-eosin sections. With Nissl and Hortega stains, the leptomeninges showed inflammation with fibroblastic proliferation. There was a severe degeneration of the ganglion cells of the entire cerebral cortex. The most severe damage was found in the temporal lobes and hippocampal gyrus. In general the cell damage was of the ischemic type, resembling remarkably the changes seen in a brain damaged by the ischemia following a vascular occlusion.

The authors do not believe that during the period of the operation there was an anoxemia of sufficient degree to produce the changes in the brain. They do admit, however, that there may have been a localized anoxia which did not give any clinical manifestations. They believe that the most likely explanation is that the mechanism of cyclopropane anesthesia, like that of nitrous oxide, depends in part on anoxemia, but, unlike that of nitrous oxide, the anoxemia is localized and clinical cyanosis is lacking. It may be that many so-called specific, toxic, and

poisonous substances operate on the brain and other organs through the production of cellular asphyxia.

WILLIAM C. BECK, M.D.

Jones, O. R., and Burford, G. E.: Massive Atelectasis Following Cyclopropane Anesthesia. *J Am Med Ass*, 1938, 110: 1092

The authors report in detail 4 deaths which have occurred following the use of cyclopropane as an anesthetic. Autopsy of these cases showed massive collapse of one or both lungs. The authors also comment at length upon the fact that pulmonary complications following long-continued cyclopropane anesthesia, especially for operations on the stomach, have increased more than should be expected.

Complete atelectasis of a whole lobe has of recent years been assumed to be obstruction in the main bronchus followed by absorption of the alveolar gases behind the obstruction. When the obstruction has become effective, the time required for the development of atelectasis depends on the rate of absorption by the lung of the gases distal to the obstruction, provided the circulation in the lung is intact and the alveolar epithelium undamaged. Great variations occur in the rate of this absorption. Anesthetic gases are absorbed in a matter of minutes, as are also oxygen and carbon dioxide. The inert gases, helium, hydrogen, and nitrogen, require from eighteen to twenty-six hours for absorption. The normal lung filled with air contains about 79 per cent of an inert gas, nitrogen, which has a supporting effect upon the expanded alveoli.

When during an operation the rapidly absorbable gases fill the alveoli this support is quickly lost as the gases are absorbed and the alveoli collapse because of the lack of inert gas which should be present to keep them distended. This condition favors atelectasis of the lungs.

In this way the authors explain the fact that collapse of the lungs occurred in these 4 cases, which in 3 instances occurred only some minutes after the anesthetic had been discontinued and the operation finished. In no case was an obstructing plug found at autopsy in any of the main bronchi.

The obvious remedy is to add inert gas of one type or another to the cyclopropane mixture. Nitrogen would be effective, but the most useful is either hydrogen or helium. J. DANIEL WILLEMS, M.D.

ROENTGENOLOGY

Esguerra Gómez G. Radiology in Amebiasis
Diagnosis. *Radiology* 1938 31 15

Of 6,540 coprological examinations made in Bogotá, Colombia, 20.16 per cent were positive for *Entamoeba histolytica*. Of 2,218 hospital examinations in children, 17.18 per cent were positive. In a similar number of hospital examinations in adults, 37.01 per cent were positive. Seventeen and eight tenths per cent of 500 examinations in one private laboratory and 10.04 per cent of 1,604 examinations in another private laboratory were positive.

The radiological findings in amebic infestation are relatively little known. The author was astonished to find so little scientific literature on the subject. He quotes the observations of several authors.

It is usually the case of chronic amebiasis with variable digestive disorders but without dysenteric phenomena that comes to the radiological laboratory. The radiological signs noted by the author are several. The first is an increased rapidity of the travel of the first part of the opaque meal through the cecum colon segment. Often the barium may be found in the sigmoid and rectum at the end of six hours. A part of the same meal which traveled through the colon so rapidly may be retained in the stomach from twenty-four to seventy-two hours. Another radiological sign is hypersegmentation of

the cecum colon segment, more especially in the transverse colon, at the six-hour period. There is marked inequality in these segmentations but as a general rule the same narrowing and change of contour persists in the same segments in all examinations. It is a relatively common observation that the fore part of the opaque meal is distributed in zones quite isolated from one another and often impregnates the mucosa and shows hypertrophy of the folds. Diminution or absence of haustral markings or segmentations of the cecum and colon is observed in those few cases accompanied by ptosis of the transverse colon dilatation and wall atony in which the amebic infestation started long ago. Examination by the opaque enema method frequently demonstrates a uniform narrowing of the left part of the colon with decreased elasticity of the walls.

It is possible not to find any diagnostic radiographic signs at the onset of acute amebiasis or in cases in which dysenteric phenomena are slight. The author quotes abstracts of several interesting case reports and presents illustrations to demonstrate the characteristic findings. Figure 1 demonstrates the six-hour gastric retention, hypersegmentation, irregularity of the colon, and the rapid progress of the meal at the six-hour period in a case of amebiasis.

The most common radiological findings are elementary induration of the cecum and colon walls and the presence of saw-tooth contours. Such radiological changes in isolated intestinal segments are characteristic of the presence of ulceration.

HAROLD C. OGDEN, M.D.

Soto J. A., Bruntschwig A. and Schlutz F. W.
An Experimental Study of the Effects of Roentgen Irradiation upon Acute Pyogenic Infection of the Skin and Subcutaneous Tissues. *Surgery* 1935 3 503

Although the beneficial effects of roentgen irradiation upon a large variety of acute and chronic infections in man have been repeatedly cited in the literature for many years, controlled experimental evidence for the efficacy of such treatment in acute pyogenic infections has been reported in but a relatively few instances. Some of the observations of this nature are reviewed briefly. Because of the fact that most of the conclusions drawn are based upon results obtained when different animals were used as controls, their reliability seems questionable. The authors attempted to check them by a series of experiments in which non-irradiated control lesions were produced in every instance in the same animal that bore irradiated lesions.

For this purpose groups of rabbits were injected with various types of pyogenic bacteria and observations were made before and after irradiation with various doses of roentgen rays given at variable



Fig. 1

intervals before and after the injections. Observations were made, in each instance, of the degree of inflammation and the time of healing. In order to obtain information as to a possible cause for the changes observed, microscopic examinations of sections of the involved areas and smears of pus obtained from them were also studied. A separate set of experiments to determine the effects of irradiation on capillary permeability as a possible cause for the changes noted were also carried out. Finally, exposures were given to cultures of bacteria *in vitro* to ascertain if the addition of rabbit's serum to the culture medium would influence their reaction in any way. The results in connection with the last test were negative. Detailed descriptions of the experiments are included.

The authors' conclusions are as follows:

1. Moderate doses of 200-kv roentgen irradiation, filtered by 1 mm copper and 1 mm aluminum, i.e., 600 roentgens, reduce the severity of acute pyogenic infections in the skin and subcutaneous tissues, but do not necessarily hasten the final healing of these lesions. In a small percentage of cases the irradiated lesions healed more slowly than the controls.

2. The optimum opportunity for beneficial effects is obtained when the irradiation is given shortly after the injection of the organisms (within five hours) and decreases as the suppurative phase (abscess formation) of the infection becomes more prominent. Irradiation twenty-four hours prior to bacterial injection did not inhibit the severity of the subsequent lesions, indeed, some of the lesions in such areas healed more slowly than the controls.

3. No evidence was obtained that the beneficial effects of roentgen irradiation in inflammatory processes are due to widespread destruction of the leucocytes, especially lymphocytes in the field with liberation of antibacterial ferments. In fact, the exudate in the irradiated lesions was practically identical with that in the controls.

4. Evidence is presented to indicate that a factor in the mechanism of the beneficial action of irradiation is an effect upon the capillary bed of the field, which results in more rapid absorption of soluble substances from the inflamed areas. This would permit of a less intense leucocytic mobilization to cope with the infection. ADOLPH HARRUNG, M.D.

Doub, H. P., Hartman, F. W., and Mitchell, C. L.: The Immediate and End-Results of Radiation Therapy in Certain Benign Bone Tumors. *Radiology*, 1938, 30 420.

The characteristic roentgenological and pathological findings in giant-cell tumor are discussed in some detail, and the results of treatment as reported by various authors are abstracted. The authors recently made a study of 22 cases of benign giant-cell tumor from the Bone Tumor Registry, which had sections showing the histology of the original tumor, and a satisfactory follow-up later. There were 9 cases treated by radiation only in which the

patient remained well. In 3 cases of benign giant-cell tumor in which radiation therapy was administered, the lesions later became malignant. In 5 cases in which radiation therapy was applied, resection or amputation was performed later.

The malignant variation of giant-cell tumor is discussed in some detail, and the literature on this subject is reviewed.

The authors report 4 cases of giant-cell tumor treated by them in which there was an adequate follow-up. One of the patients developed evidence of fibrosarcoma, although the original finding was benign giant-cell tumor. The authors believe that roentgen therapy and surgery should not be combined in the treatment of giant-cell tumors. Recorded statistics show a high percentage of cured cases resulting from radiotherapy. There is an increasing number of cases reported in the literature in which there is a transition from benign giant-cell tumor to osteogenic sarcoma. The cause of this transition is not clear, although injury or chronic irritation may be responsible. The small, repeated doses of roentgen therapy often used in the treatment of giant-cell tumor may have a stimulative effect on the tumor cells. The authors raise the question of increasing roentgen dosage to higher limits.

HAROLD C. OCHSNER, M.D.

Leucutia, T.: Three-Year Results in the Treatment of Malignant Neoplasms with Supervoltage Roentgen Therapy. *Radiology*, 1938, 30 356.

Supervoltage roentgen therapy implies the use of roentgen rays which are obtained with voltages higher than 200 kv., in contradistinction to deep roentgen therapy which means irradiation with a voltage of 200 kv. or thereabouts. In Harper Hospital, Detroit, during the years 1933 and 1934, 312 cases of malignant neoplasms were treated mostly with roentgen rays obtained with 500 kv. equivalent (7 mm Cu filter). These cases are now analyzed, and the results are compared, on the basis of survival curves, with those which were obtained with the 200 kv. equivalent radiation in previous years, some of the comparisons dating as far back as 1922, or fifteen years.

The material is divided into three main groups: (1) cases which proved complete failures after the 200 kv. equivalent radiation and later were subjected to supplemental irradiation with 500 kv. equivalent, (2) cases which were primarily irradiated with 500 kv. equivalent, but in which results or survival curves showed no change from the 200 kv. equivalent radiation therapy, (3) cases which were primarily irradiated with 500 kv. equivalent and in which there was a very definite improvement when compared to those receiving 200 kv. equivalent radiation therapy.

It is a custom at Harper Hospital to classify all malignant neoplasms, as far as possible, into 5 stages, according to the degree of demonstrable clinical extension. These stages are I, local lesion, II, metastases to the first regional lymph nodes, III,

metastases to the second regional lymph nodes through anastomosis with the first IV wide local invasion by continuity, and V distant metastases. When supervoltage roentgen therapy was first introduced in 1933 and during the following year of 1934 it was applied chiefly to cases of Stages III and IV. The cases in Stages I and II are considered operable and therefore in these groups the old established methods of treatment were pursued either by employing a combination of surgery and irradiation or by irradiation alone with a technique as formerly practiced. Stage V on the other hand represents such extensive dissemination of the malignant process that the possibility of a cure is practically eliminated and palliation may be brought about by other less expensive methods.

A tabular arrangement of the three year results permits the following conclusions:

1. If a thorough irradiation with 200 kv equivalent has led to failure in a certain instance the supplemental irradiation with 500 kv produced no material improvement in the final results.

2. In the cases primarily treated with supervoltage roentgen therapy no change in the law of radiosensitivity was observed when comparison was made with the 200 kv irradiation. It appeared in this respect that there is no direct quality dependence or selective reaction. The groups of malignant

tumors which proved to be unfavorable to the 200 kv equivalent irradiation continued to remain unfavorable also to the 500 kv equivalent irradiation.

3. Primary supervoltage roentgen therapy without association of other methods led to better results in all those instances in which the irradiation had been rendered more efficacious than the 200 kv equivalent radiation but in which the malignant process was still of local character although the invasion by continuity appeared very considerable. The increased efficacy may be attributed to better absorption conditions, and signified an indirect quality dependence or differential action. If all malignant neoplasms are divided into 5 clinical stages it is found that supervoltage roentgen therapy leads to definite improvement of the three year results in Stages III and IV in those groups which were favorable also to the 200 kv equivalent radiation. The best example is represented by the carcinoma of the uterine cervix in which the percentage of three year survival was increased from 30 to nearly 60. A similar improvement was obtained in certain bulky skin cancers in carcinoma of the rectum in the earlier cases of carcinoma of the prostate, in some types of sarcoma in carcinoma of the thyroid and to a lesser extent in metastatic carcinoma of the lymph nodes of the neck.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Bond, D. D., and Wright, D. G.: The Treatment of Hemorrhage and Traumatic Shock by the Intravenous Use of Lyophile Serum. *Ann Surg*, 1938, 107 500

Normal blood serum may be preserved in desiccated form. Essentially, this procedure is one of rapid freezing at a very low temperature, and rapid dehydration from the frozen state under high vacuum. This leaves all the solid elements of the serum in a dry form. The proteins appear to be unaltered and their antibody properties are preserved in full titer. In this form serum may be preserved for extended periods, it is readily dissolved in water to make an isotonic or hypertonic solution. Because of its rapid solubility, this product is called "lyophile." For intravenous use, serum must be processed twice by this method, with an intermediate filtration to remove fat particles.

Experiments were performed in which lyophile serum was redissolved in water and then injected intravenously into dogs in which the blood pressure was severely reduced by trauma to the gut or to an extremity, and by acute hemorrhage. The blood pressure was raised and maintained for at least several hours by this procedure. The immediate availability of lyophile serum, its theoretic suitability, and its action upon animals in shock, suggest its use for clinical shock and hemorrhage.

JOHN H. GARLOCK, M.D.

Black, J. I. M.: The Lympho-Epitheliomas. *J Laryngol & Otol*, 1938, 53 225

We are indebted for the idea and first description of the lympho-epitheliomas to Regaud and Schminke, who published independent papers in 1931. It seems that attention was first turned to this class of neoplasm because of an extreme degree of radiosensitivity. This characteristic was coupled with a distinctive histological structure and a certain number of clinical indications which were thought to justify a separate group and name for the neoplasm described. Regaud originally noted a tumor consisting of two elements, a primitive type of epithelium and lymphocytes, and suggested that the association was constant and characteristic, and therefore justified the name lympho-epithelioma.

Apart from confusions due to variations in the class, a confusion with other similar tumors easily occurs and there is no doubt that the histological diagnosis can be extremely difficult. Ewing pointed out the difficulty of differentiation from the transitional-celled carcinomas, moreover, previous authors had apparently not thought the lympho-epitheliomas worthy of a special class and included them in the epitheliomas as such or as transitional-

celled carcinomas. It must be stated that although the lympho-epitheliomas possess certain outstanding features, these features are by no means confined to this class alone but are shown equally as well by any highly malignant, rapidly growing, and radiosensitive tumor, such as a transitional-celled carcinoma of little differentiation, a sarcoma, and even a lymphadenoma. The diagnosis must rest upon a histological examination and is of great importance with regard to the prognosis. It may be said that the features shown are a tendency toward early spread to adjacent lymph nodes while the primary lesion is still small and obscure, a great radiosensitivity of the lesions which are produced, and, after treatment, a tendency toward distant metastases to the vertebral column and abdominal organs. Apart from the thymus the neoplasm arises, as a rule, in the tonsillar region or nasopharynx, although cases have been described in which it occurs in the hypopharynx and the thyroid. A significant fact is that no one has yet described a lympho-epithelioma of intestinal origin. The age at which it is most commonly found seems to be middle or late life, although Ewing states that a similar or identical tumor occurs in young people at about fifteen years of age. The tumor seems to be slightly more common in males, and as a general rule it seems that its occurrence is unlikely during the period of development and greatest activity of the lympho-epithelial organs. In all the highly malignant types of neoplasm with a special predilection for early metastases it has been found that surgical extirpation holds little or no hope of cure. The lympho-epitheliomas are no exception to this rule and, in addition, occur in places which because of their inaccessibility are particularly unsuited for radical surgical extirpation.

It is said that the untreated lympho-epitheliomas run a fatal course in about two or three years, the end being reached with massive local spread of the tumor. Of the treated cases which have ended fatally, some have pursued the same course, local regression not having been obtained, while others have not shown any local recurrence, but terminated fatally as the result of distant metastases. The prognosis of the treated cases is variously stated in the literature, and some confusion seems to exist because of premature optimism. The final impression gained, then, is that of a malignant neoplasm running a fatal course in less than two years if not treated. Treatment by x-ray irradiation should produce very rapid local regression. Failing a quick response, the patient must be abandoned as hopeless. If a good immediate result has been obtained, local recurrence is unlikely, and if the patient passes the three-year limit without developing distant metastases, it appears that all will be well. It must always be remembered that lymph-node deposits can be treated and regression may be obtained,

but the treatment of skeletal deposits is probably useless

The general impression gained from a study of these tumors is that of confusion, and many tumors which would possibly be described as lympho-epitheliomas have behaved in a variety of different ways and suggested that they are of different types. The small group which the author has isolated as sufficiently similar to be classified together gives the impression of a moderately well differentiated tumor probably best thought of as sarcomatous; however, whether it is typical of what has been described as lympho-epithelioma is difficult to judge. At the moment it seems that the diagnosis of lympho-epithelioma is probably best left alone in clinical circles, a description of the tumor should be given dealing principally with the degree of development of the large cells and the extent of lymphocytic content of the tumor. This will make possible the determination of the best treatment and a fairly accurate prognosis. JOSEPH A. NARAT M.D.

Oster R. H. and Salter W. T. Immunization against Neoplasia: Its Effect on the Nitrogen Metabolism of the Host. *Am. J. Cancer* 1935, 31: 422

In 1925 Dodds found that certain rats which received inoculation with neoplasms showed a low concentration of urea in the blood after treatment with roentgen rays. Independently several investigators had shown that inoculation of tumors into mice may confer immunity to subsequent inoculation, an immunity which persists after removal of the tumor. The term immunity is used here in a specialized sense to indicate resistance against tumor growth on the part of the host. This article presents evidence that animals so immunized show the peculiarity in nitrogen metabolism which Dodds described in naturally immune animals. It suggests that susceptibility to malignant disease has a definite chemical background.

The apparent concentration of urea in the blood during fasting of normal and tumor-bearing mice is about 30 mgm. per cent following twenty-four hours of fasting even after x-ray irradiation. Immune animals show the same value for urea until irradiated. Thereupon the apparent blood urea drops steadily for three days to about 20 mgm. per cent, and climbs back to normal in the course of the next week.

The excretion of nitrogen in the urine shows the urea to be consistently about 81 per cent and ammonia 9 per cent of the total amount of nitrogen excreted on a mixed diet. This is true despite an excessive excretion of nitrogen the day after x-ray treatment in both normal and immune animals. The drop in blood urea therefore is not due to a specific failure of the normal urea-producing mechanism.

The response of apparent blood urea is independent of the actual presence of a tumor and indicates that the immunity is a property of the host primarily. Indeed, under certain special laboratory conditions the chemical reaction may be

used statistically to predict in average figures the approximate fate of inoculated neoplasms subsequently introduced. These observations suggest that the difference between a malignant and a benign tumor may exist in part in the chemical constitution of the host.

JOHN H. GARLOCK M.D.

Schneider E. Vitamins in Surgery (Die Vitamine in der Chirurgie). Stuttgart: Ferdinand Enke, 1937.

In the introduction to his book the author first gives a short review of the history of the discovery of the vitamins and then continues his work with a relation of our present-day knowledge of the nature and *modus operandi* of the vitamins A, C, D and the group of vitamins B which currently play the chief rôle in surgery. He then discusses the question of vitamin storage and vitamin requirement during the period of body growth and thereby comes to the conclusion that the capability of man for storing vitamin A is highly problematical and that as far as vitamin C is concerned this capability is completely absent. This fact can explain the phenomenon, that within a relatively short time during the course of disease secondary hypovitaminosis can make its appearance but in many instances it may take its course so insidiously that the typical clinical symptoms of a full-blown deficiency disease will hardly become obvious.

The basis for this fact is to be sought in the large span between the optimal vitamin dose and the particular amount of vitamin which is still sufficient to prevent the appearance of deficiency symptoms. The direct influence of the surgical procedure and/or the anesthesia upon the vitamin complex is to be seen according to the scant publications which concern themelves with this question in a transient increased vitamin requirement for vitamins A and C and an increased excretion of vitamin A from the liver. A longer chapter is devoted to the secondary hypovitaminosis which makes its appearance as the usual accompanying symptom of inflammation. In every inflammatory process the brunt of the reparative activity falls above all upon the connective tissue which is called upon to replace the increased cellular destruction. Vitamin C has greater significance for the connective tissue than any other vitamin, in a similar manner as vitamin A is important for the epithelium (epithelium-protective vitamin). In the presence of an inflammation, therefore, the requirement for vitamin C is particularly increased. However, the vitamin C requirement is increased not only in inflammation but in every increased physiological activity of the cells.

The assimilation of vitamin C into the cell body is brought about through the Golgi apparatus, i.e., a network consisting of protein bodies and lipoids which permits exactly as much vitamin C into the cell as the latter requires at the particular moment. For this reason, a storing of vitamin C is just as impossible as an active increase of the cell function as the result of an increased administration of vitamins. In every inflammatory process, therefore, a hypo-

vitaminotic condition may rapidly develop, especially when the resorption conditions in the bowel are disturbed. In this condition the daily administration of 300 mgm of cevitamic acid, given parenterally if necessary, has proved of therapeutic value. In a moderately severe pyogenic infection, correction of the Vitamin-C deficiency may be assumed to have been attained after about ten days, this can be proved through the increased Vitamin-C excretion in the urine.

However, not only is the requirement for Vitamin C increased in inflammatory processes, but there is also an increased demand for Vitamin A, which probably has its origin in the disturbances of the physiological activity of the pro-vitamins in the toxically damaged liver. At any event a high-grade deficiency of Vitamin A has been shown to exist in the liver in chronic inflammation. In addition to this viewpoint, another fact is of importance, i.e., that in addition to an increased consumption of Vitamin A, there is also an increased excretion of Vitamin A in the urine, a condition for which the Vitamin-C hypovitaminosis which occurs in inflammation is blamed.

Vitamin-C deficiency is supposed to increase the permeability of the intercellular substances of the kidney for Vitamin A, and attempts to stop the excretion of Vitamin A by the administration of Vitamin C have been successful. The author then reports the various hypotheses concerning the mode of action of the vitamins administered during infections, which various authors have attempted to explain on the basis of an increase of the catalytic activity of the blood, an increase in the efficiency of the reticulo-endothelial system, an increase of the bactericidal powers of the blood, and an increase in the detoxification powers of the blood. On the other hand, the author explains the favorable action of the auxiliary vitamin therapy in inflammations on the theory that this additional vitamin administration obviates a deficiency condition of the increasingly destroyed vitamins.

In the chapter concerning the hypovitaminosis of cancer patients, the author criticizes the partially contradictory observations concerning the stimulatory and/or depressing effect of vitamins on tumor growth. On the basis of his own researches, he comes to the conclusion that Vitamin C has a reducing action similar to the reducing action of sodium bisulfite and sodium thiosulfate and is capable of exerting a depressing influence upon the tumor growth and at the same time increasing the resistance powers of the organism, and he recommends the supplemental administration of Vitamin C in patients suffering from cancer.

In the treatment of wounds the secondary hypovitaminoses similarly play a great rôle, and these have been successfully combated by the parenteral administration of cod-liver-oil salves of high vitamin content, since Loehr, Unger, and Zacher, as well as Saito have conclusively shown the resorption of the fat-soluble Vitamins A and D. Kasahara and

Kawashima have proved the direct assimilation of Vitamin D from the wound surface. Eitel has demonstrated, through the administration of doses of thyrotropic hormone, an increase in the rapidity of wound healing by the indirect means of stimulating the thyroid. He has also shown this to take place on a hormonal basis, an indication of the close relationship between the mode of action of the vitamin and the hormone. The author then occupies himself at length in the rest of the chapter with the hormonal disturbances due to the disturbance of the vitamin balance, and critically explains the relationship between Vitamins A and C on the one hand, and the thyroid hormone on the other. Vitamin A has an anti-thyroidal action and when given in large doses hinders the metabolism of glycogen in the liver. Vitamin C in hyperthyroidism acts only in the sense of a function regulator and not in an anti-thyroidal manner as Vitamin A.

Of value for the surgeon are the practical conclusions, which the author draws from his observations, with reference to the operative risks and secondary hypovitaminosis. He recommends that in cases with a hypovitaminosis of Vitamins A and C which is capable of increasing the danger, the Vitamins A and C be administered in abundant doses, because in this way liver-protecting therapy in the sense of glycogen fixation can be exerted, and a strengthening of the reticulo-endothelial system and a protective action on the epithelium will follow.

In addition to the discussion of the Moeller-Barlow disease and rickets, the author devotes himself extensively in the following chapter to the question of the origin of epiphyseal necrosis, which he for the first time associates with hypovitaminosis of Vitamin A. He attributes the latter to a possible disturbance in the co-relation between Vitamins A and D in which the Vitamin D is present in excess. As to the relationship between hypovitaminosis and calculus-forming diseases, we can rely only upon suppositions. Since Vitamin A is an epithelium-protecting vitamin, it may possibly be of value in the after-treatment of patients with calculi, in the sense that it may prevent an excessive proliferation of epithelium in the mucous membrane, and in this manner prevent the formation of new calculi.

In conclusion, the author discusses the limitations and efficiency of vitamin therapy, and at the same time warns against over-enthusiastic expectations. He expresses the hope, however, that as a result of further research, the possibility of therapeutic use of the vitamins may yet reach an unexpected expansion. (LOEHR) HARRY A. SALZMANN, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Longcope, W. T.: Problems Relating to the Invasive Properties of Hemolytic Streptococci and Their Control by Sulfanilamide. *Am. J. M. Sc.*, 1938, 195: 577.

The author states that the variety, special character, severity, and outcome of hemolytic strepto-

coccal infections are probably determined by many factors and depend upon the predominance of one or another of the biological properties of the organism and upon the varying state of resistance or susceptibility, and immunity or allergy that modify the responses to infection. Particularly unfavorable signs are a continuous local spread of the infection and an invasion of the blood stream. In a study of 166 cases of hemolytic streptococcal septicemia, mainly in adults a fatality rate of 75.3 per cent was found. Excluding the few cases of scarlatina and endocarditis the highest mortality occurred in erysipelas and cellulitis and the lowest in mastoiditis. Invasion of the blood stream was most frequently demonstrated during the first week and after the fifteenth day of the disease. The average duration of the disease in the fatal cases was only twelve and one half days. Most dangerous to life is the extension of the infection to the peritoneal cavity or to the meninges, at least 95 per cent of patients with meningitis succumb, and the mortality in peritonitis is perhaps still higher.

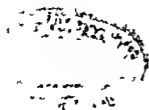
The pharmacological and experimental action of sulfanilamide is discussed and its remarkable thera-

peutic effect in the serious infections due to hemolytic streptococci is recorded. Sulfanilamide has a most pronounced effect in the early stages of these infections. Experimental and clinical studies have indicated that the drug is most effective when the infecting organism is subjected to a concentration of the chemical sufficient to produce an optimal bacteriostasis and when the body acquires and retains the power to rid itself of comparatively small numbers of viable and perhaps highly virulent organisms. Elimination of hemolytic streptococci from persistent and latent infections of the tonsils is not always produced by the use even of comparatively large amounts of the drug over considerable periods of time.

The surgical methods which are commonly employed in the treatment of infections should not be abandoned when sulfanilamide is used. Free drainage of infected areas is undoubtedly beneficial. The author recounts some of the evidences of intoxication and points out that the most alarming of these are rare and depend probably upon an individual idiosyncrasy to this drug.

WALTER H. NADLER, M.D.

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of bacteria acts upon the capillary wall. It may either liquefy it or produce an inflammatory reaction resulting in closure of the capillary wall or clotting of the fluid within it. The same effect is produced on larger vessels, venules and arterioles. As the process advances the larger veins and arteries become thrombosed and then liquefied, a sterile portion of clot progressing in both directions ahead of the infection and liquefaction. All of these steps can be seen in microscopic slides of inflammatory processes in tissue.

Pathology. The portal of entry, particularly in children, may be hardly noticeable and the major focus of infection may be deep within the body. In the majority of cases, however, the major focus is at or near the place where the organism entered the body. In the gross, the primary focus generally presents either a diffuse cellulitis or an abscess containing pus, which is a more or less homogeneous fluid made up of dead and living leucocytes, dead and living bacteria, and cellular debris. A Gram-stained slide of the abscess wall shows countless organisms in the exudate on the surface, but the number diminishes rapidly from the surface inward toward normal tissue. When an abscess is opened with the knife there is bleeding from the portion of the wall which is cut but not from the wall of the abscess itself. In that wall there are innumerable blood vessels which have become thrombosed and then liquefied and the end of every one is plugged with an infected thrombus. Out in the periphery, the clots filling these vessels may be sterile, but as the process advances in untreated cases the organisms in the wall of the abscess advance steadily within the blood vessels with a successive infection and liquefaction of these myriads of clots. When the clot reaches a large vessel it may break off and be carried peripherally if that vessel is an artery, or centrally if it is a vein, and be filtered out by some capillary too small to let it pass. If the clot is small and sterile nothing of importance happens. If it is large enough it may mechanically cause local gangrene or even death, as for example, a large pulmonary embolus. If the clot contains bacteria, it may produce another focus of infection from which the process may be repeated.

It is not surprising, therefore, that from any infected focus, either primary or secondary, there is a constant entrance of bacteria into the blood stream either as individual organisms or incorporated in a blood clot. The number will depend to a considerable extent upon the virulence of the organisms, their ability to multiply within the area of infection, and the potency of their toxins to kill or injure tissue.

Because of the prevalence of serious infections in war wounds, the opportunity was afforded the army pathologists to study a large number of fatal cases which had yielded positive blood cultures before death or at autopsy. Pappenheimer (18) and others found that almost invariably in these cases there could be found a gross focus of infection in some organ or body cavity in the walls of which a suppurative thrombophlebitis existed which opened directly into the blood stream. In Neuhof's series (17) of 150 cases of surgical septicemia in civilian practice a suppurative thrombophlebitis was found in 41 per cent.

In the majority of instances in fatal cases, there are multiple metastatic foci of suppuration where infected emboli or individual organisms have lodged and have formed bacterial colonies and are repeating to some extent the destruction of tissue which occurred at the primary site. A certain number of cases also develop a vegetative endocarditis, a potent source of infected emboli on the arterial side. In cases which terminate in recovery we may assume that the process is held in check by a fixation of the clots within the blood vessels and a subsidence of the infection within the clots either with or without the help of the therapeutic procedures described below.

Experimental conceptions. In experimental work it has been known for a long time that living bacteria could be introduced directly into the blood stream of animals and that death depended upon the kind, the virulence, and the number of organisms injected. It was found that many organisms were entirely without effect even when injected by the billions, and that in the case of many organisms of high virulence there is generally a fixed minimal lethal dose of several thousand organisms. For example, by frequent animal passage of hemolytic streptococci, Dochez and his co-workers (6) were able to increase the virulence of only 20 per cent of his strains to the point where 1,000 organisms would kill a mouse. This has been repeatedly confirmed so that we can be sure that the animal body and probably the human body have the power to destroy many highly virulent organisms when they are introduced into the blood stream.

Hopkins and Parker (9), among others, some years ago tried to discover the mechanism of this phenomenon. After determining the minimal lethal dose of a strain of hemolytic streptococcus for rabbits, they injected both lethal and sublethal doses into the blood stream of a series of these animals, and similar or larger doses into the blood stream of resistant cats. They immediately estimated the number of organisms per

INTERNATIONAL ABSTRACT OF SURGERY

OF SURGERY

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PRINCIPLES OF SURGICAL PRACTICE
THE BACTERIOLOGICAL AND SURGICAL PRINCIPLES IN
THE MANAGEMENT OF SURGICAL SEPTICÆMIA

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1. The first part of the document is a letter from the President of the United States to the Congress, dated January 1, 1861. It is a formal communication, and it is written in a very formal and dignified style. The President begins by addressing the Congress, and then he proceeds to discuss the state of the Union. He mentions the progress of the country, and he also mentions the difficulties that the country is facing. He then goes on to discuss the policy of the administration, and he ends the letter by expressing his confidence in the Congress.

Polymyxins When bacteria enter the physiological interior of the body, the actual number is probably small—tens, scores, perhaps hundreds and not thousands or millions. They are usually introduced through a break in the surface either

the primary defense of the body are the mucous membranes, which secrete substances surrounded by dead or injured tissue or foreign bodies. Many of them are not in a favorable growth phase to adapt themselves to the environment and they fail to grow and metabolize.

from the local defenses by the injured tissue or by metabolic activities, and they may be produced for their destruction by the phagocytes in which they are attracted to the site of the injury. As far as they are concerned, the foreign bodies are not different from the local defenses by the injured tissue or by metabolic activities, and they may be produced for their destruction by the phagocytes in which they are attracted to the site of the injury. As far as they are concerned, the foreign bodies are not different from the local defenses by the injured tissue or by metabolic activities, and they may be produced for their destruction by the phagocytes in which they are attracted to the site of the injury.

...a colony and produce their poisons. These organisms may attract or repel the phagocytic man... cells or they may hinder the dead tissue... or injure living tissue. If leucocytes are attracted, the organisms may be phagocytized by

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cubic centimeter of blood and made repeated counts at frequent intervals. They found that the number of organisms in the circulating blood rapidly diminished.

In the sublethal doses the organisms usually disappeared completely in from one to two hours and did not reappear. In the lethal doses they rapidly diminished in number and in many instances completely disappeared, but after a brief interval they began to reappear in ever-increasing numbers until the death of the animal four or five days later. Furthermore, repeated doses of organisms were similarly rapidly "cleared" from the blood stream. When the resistant cats were killed and examined one-half hour after the injection, the bacteria could be found in large numbers in the endothelial phagocytes of the lungs. Cultures from the ground-up tissue of various organs yielded enormous numbers of bacteria from the lungs, many from the liver and spleen, a few from the bone marrow and lymph glands, and few or none from the blood, muscles, or kidneys. Cultures from cats killed several hours after the injection showed a marked decrease of bacteria in the lungs and liver, but not such a great decrease in the other tissues. If pieces of lung and liver tissue were excised the decrease in the number of organisms still took place, but the number increased in the excised spleen. Extracts of lung did not have the same bactericidal action. These workers concluded that the chief agents in clearing the blood of organisms were the endothelial cells of the lungs and liver. In lethal doses bacteria distributed from other foci overwhelmed this clearing mechanism.

Experimental septicemia is different from clinical septicemia in at least one important respect. In the former, enormous doses of bacteria are introduced at one time into the circulation, while in the latter, small numbers are introduced into the blood stream more or less continuously. The mechanism by which these bacteria are destroyed, however, is essentially the same.

The body defenses. The clearing mechanism of the blood is both cellular and humoral. It has been studied by numerous workers in the field of immunology. Kolmer (11) has recently summed it up as follows.

The cellular elements carry on phagocytosis of bacteria and comprise the polymorphonuclear leucocytes, the macrophages of the lungs, and the histiocytes of the reticulo-endothelial system. The humoral components include the various immune elements in the blood, natural or ac-

quired, agglutinins, opsonins, bacteriolysins, antitoxins, leucines, plakins, and complement.

Under the most favorable conditions of artificial cultivation, bacteria multiply about once every half hour. Their multiplication within the blood stream must be very much slower than this because it has been shown repeatedly that whole blood is not a favorable medium for bacterial growth. The blood makes one complete circuit of the body every minute, passing through the endothelial lined capillaries of the periphery, the lungs, and possibly the liver also with each round. An organism has to run the gauntlet of phagocytic cells 60 or more times before it has time to multiply. It is extremely unlikely that there is any multiplication of bacteria in the blood stream until the blood has ceased to flow.

When a blood culture is taken from a peripheral vein at the elbow any organism which is recovered has passed the gauntlet of the lung capillaries and the capillaries of the periphery of the forearm or hand. The lungs filter out most of the embolic clots, and the endothelial cells pick up the individual organisms. If an attempt is made to determine the number of organisms per cubic centimeter of the peripheral blood by means of agar pour plates, we find that even extremely sick patients seldom yield more than 100 colonies per cubic centimeter of blood. This is a surprisingly small number if one considers that an ordinary twenty-four-hour broth culture of bacteria has anywhere from 1 to 5 billion organisms per cubic centimeter.

The presence of bacteria in the blood stream is simply an indication of what is going on around the distributing focus. The continued presence of bacteria in the blood indicates that the focus is distributing organisms faster than the clearing mechanism can take care of them.

Bacteriology. For the rational treatment of sepsis it is, of course, of vital importance to know as soon as possible which organism is causing the disease. This knowledge may at once indicate whether the patient should be treated by medical or surgical methods. Certain of the organisms commonly found in the blood render the case medical because there is a tendency toward self-limitation and resolution without extensive destruction of tissue. For example, the meningococcus, the gonococcus, the bacillus influenzae, and, for the most part, the pneumococcus fall into this category. Others have a tendency to cause necrosis of tissue and the localization of pus. They are called pyogenic or necrotizing organisms. When these are found, in the present state of our medical knowledge, the case is rendered surgical, for the situation as far as the patient is concerned may

be greatly benefited by the surgical procedures of excision, incision, or isolation. The organisms responsible for surgical sepsis in the order of their frequency in Neuhof's series (17) are as follows:

- 1 Hemolytic streptococcus
- 2 Hemolytic staphylococcus aureus
- 3 Non hemolytic staphylococcus aureus
- 4 Non hemolytic streptococcus
- 5 Bacillus coli
- 6 Anaerobic non hemolytic streptococcus
- 7 Staphylococcus albus
- 8 Bacillus mucosus capsulatus

Scott's series (20) and our own roughly correspond to Neuhof's.

An early knowledge of the causative organism may point to a hidden focus for we know that certain organisms have a predilection for certain tissues and in cases of sepsis are generally found in certain places in the body. Conversely, if the lesion is clinically apparent, experience leads one to predict with some degree of certainty which organism will be found in the blood and its clinical behavior can be foreseen to some extent. For example, the hemolytic streptococcus is by far the most common organism in sepsis of otitic origin, infection of tendon sheaths or in sepsis from a diffuse cellulitis while the staphylococcus aureus is more commonly associated with sepsis following carbuncles, suppurative parotitis, well localized abscesses generally and osteomyelitis. Bacillus coli is the common organism in sepsis from peritonitis and from bladder and kidney-pelvis infections. The non hemolytic streptococcus is most often associated with the grave face and neck infections of dental origin. On the other hand, the hemolytic streptococcus and the staphylococcus aureus share equally in the incidence of sepsis following severe infections of the kidney-parenchyma. The bacillus coli and the non hemolytic streptococcus are equally involved and often found together in the liver and peritoneal abscesses and either or both together are occasionally found in the blood in the later stages of these diseases. The hemolytic streptococcus and the hemolytic staphylococcus aureus share equally in the incidence of vegetative endocarditis.

Clinical Manifestations. Scott (20) groups the surgical septicæmia cases into four groups:

- 1 The rapidly progressive case which is fulminating and usually fatal
- 2 The plateau type of case which slowly terminates in recovery or slowly loses ground
- 3 The transient cases which terminate in recovery quickly and often spontaneously
- 4 The terminal cases which develop during the course of some debilitating disease

Neuhof (17) has grouped his cases more or less anatomically according to the type of the primary focus e.g., bone and joint, mastoid, subcutaneous abscess, carbuncle and cellulitis, liver and gall bladder, and postpartum. He found that in his series of 150 cases chills occurred in less than half of the total number, but in more than half of the cases with phlebitis. Fever was spiking in only one third of his cases and sustained in almost as many. Metastatic foci developed in 43 per cent of his cases and multiple lung abscesses in 28 per cent.

THE SURGICAL PRINCIPLES OF TREATING SEPTICÆMIA

Prophylaxis. In considering the surgical treatment of septicæmia, prophylaxis must be given first consideration because it is so much more effective than active treatment. It is true that many cases of infection come to the surgeon with the blood stream already invaded but a far greater number of patients come to him with a seemingly trivial condition and a septicæmia develops because of the improper handling of the primary situation. These cases fall largely into two groups.

The first group comprises the punctured or lacerated wounds and those wounds caused by automobile accidents. The proper care of punctured wounds is most difficult in the individual case. These wounds occur frequently in doctors and nurses and are due to pin pricks or needle punctures received during the care of an infected case. Often the depth is not known. The question arises whether they should be opened widely at once or let alone until general symptoms develop. Except in rare instances in which the inoculation of virulent organisms is known to be heavy, soaking of the whole part in hot water at from 108 to 112 degrees F. alternately in and out for an hour at a time will abort the great majority of infections. With the first sign of inflammation however the wound should be opened to its depth, the soaking continued and an ice bag applied almost continuously to the regional lymph glands.

With regard to lacerated wounds many doctors pay too little heed to the necessity for thorough cleansing of the wound and the mechanical removal of all foreign bodies with soap and water and a sterile brush. If the edges are contused they must be debrided under block or general anesthesia until normal tissues are everywhere visible. Then if the wound is recent (within two hours) primary suture may be considered but the sutures must be applied so that any exudate

may easily escape. If the wound is more than two hours old, primary suture should be done only in highly vascularized tissues, like the face or scalp. The wound should then be closed loosely with a small rubber drain to let out the exudate, and a free opening should be made if any inflammation subsequently appears. Too many lacerated wounds are inadequately cleansed, too poorly débrided, and too firmly closed.

The second group comprises those relatively minor and well-localized infections which are traumatized, and become rapidly spreading vicious affairs. The lowly pimple which is pricked or squeezed, usually by the patient, the boil or carbuncle which is pricked or squeezed, or carbolyzed or inadequately incised with an expression of pus, by the doctor all too frequently, infected teeth or tonsils which are removed during the stages of acute inflammation, all fall into this category. If boils or carbuncles are to be incised or excised, it should be done adequately with the incision extending beyond the area of induration, and with the minimum of trauma. Teeth and tonsils should be removed only after the acute process has subsided and packing should never be left in for more than an hour. On the other hand, in acute otitis media the ear drums may require early opening to minimize the possibility of mastoid involvement.

Active Treatment In the presence of a septicemia caused by the pyogenic or necrotizing organisms, it is the surgeon's responsibility to find and, if possible, eradicate the distributing focus, with the possibility ever in mind that there may be a suppurative phlebitis in the neighborhood of the focus requiring proximal ligation or excision.

In the great majority of cases there is an abscess cavity containing pus, surrounded by a zone of cellulitis. If the process can be excised completely without sacrifice of important function or form, the whole process should be excised. If not, an ample incision should be made to the limits and slightly beyond the limits of the involved tissue. I have never seen any harm done from a clean-cut incision into normal tissues beyond the limits of an infection, but I have seen harm done, as evidenced by rapid spread of the infection, by an inadequate incision, which is so often accompanied by a breaking down of the inner wall by finger manipulation within the cavity.

If there is any suspicion of involvement of the neighboring vein, it should be proximally ligated in a normal area, and then the involved portion should be opened and drained, or excised if that

is possible. Any involved radicals likewise should be followed up until normal vein lumen is reached. Neuhof (16) calls attention to the relatively low mortality in septicemia of otitic origin with lateral-sinus thrombosis, in which it is common practice to tie off the jugular vein and its facial radicals. He exhorts the general surgeon to carry out a similar procedure when such veins as the basilic, cephalic, brachial, axillary, femoral, saphenous, or iliac are similarly involved.

If there are no surface indications to point out the distributing focus, a search must be made for it within the body. It may be revealed by the symptoms or physical signs. Pain is usually present, although it is often absent in chest infections in which shortness of breath may indicate a lung abscess or empyema. If an abscess is connected with a bronchus there is, of course, more or less purulent sputum. A liver or subphrenic abscess may be surprisingly free from pain, but the physical signs of dullness at the lung base, tenderness on compression of the ribs, or the x-ray evidence of fixation of the diaphragm may make the diagnosis clear.

In kidney infections pain may be minimal, but tenderness and swelling are frequently present, and the presence of pus in the urine if the ureter is patent indicates disease there, particularly when cystoscopy reveals that the bladder is normal and pus is coming from one ureter.

Intrapertoneal abscesses can frequently be revealed by careful abdominal examination when indurated, tender masses may be felt unless they are subphrenic or pelvic. A rectal examination may reveal a pelvic abscess or a large, tender prostate which is not infrequently the primary focus of a septicemia.

The spleen is occasionally the site of a single abscess. The enlargement and local tenderness will usually suggest the presence of such a lesion.

Perhaps the most difficult of all of the internal distributing foci to discover is endocarditis, which is usually not primary except for the streptococcus-*viridans* group. The hemolytic streptococcus and the staphylococcus aureus may produce vegetations on the heart valves late in the course of septicemia, and their presence is often not revealed until gradually increasing cardiac murmurs have developed.

As far as I know there are no instances of recovery in cases of septicemia which have developed vegetative endocarditis with either of these two organisms. The presence of the lesion is too uncertain to warrant an exploratory operation for the removal of these vegetations, although the attempt will be made some day. The other internal

foci mentioned have been and should be surgically approached. Single abscesses in the liver, kidney, or lung may be adequately drained, but multiple abscesses in these organs, be they diffusely scattered or conglomerate are only rarely successfully approached surgically although the attempt should always be made.

If only one kidney is involved by multiple abscesses a nephrectomy is essential. It is often difficult or impossible to tell whether or not the other kidney is involved in a similar process, and the urological surgeon is frequently loath to remove the obviously sick kidney but the chance of recovery if it is left in is so remote that it should be removed even with this uncertainty.

Single abscess or multiple abscesses of the spleen may be controlled by splenectomy if the infection has not already spread through the portal vein to the liver.

It may be very difficult to locate osteomyelitis or differentiate it from suppurative arthritis, particularly in the region of the hip joint. Usually the severe pain, the local tenderness, and later the swelling over the bone reveal the focus there. Suppurative foci in joints are more easily found by a routine examination of all of the joints. Unless the capsule has been broken, the intense pain on movement is almost a pathognomonic sign.

After the primary focus has been found and properly excised or incised and drained the patient should be examined completely daily for evidence of metastatic lesions. These may be revealed in a co-operative patient by swelling pain and tenderness but if the patient's sensorium has been dulled by his illness or by sedatives, these areas can often be found only by careful palpation to determine induration, swelling or fluctuation. Redness may or may not be present. Occasionally the patient tries to hide the metastatic focus in order to avoid another operation but all such approachable lesions must be widely opened and adequately drained to prevent, if possible such foci from becoming in their turn distributing foci with suppurative phlebitis in the neighboring vein and all of the dangers attached thereto.

The criterion of adequacy in the surgical treatment of either the primary or secondary foci in septicemia is the subsequent presence or absence of the organisms in the blood. If the distribution can be arrested the organisms will rapidly disappear from the blood. If they continue the surgeon is faced with the necessity of finding another focus or of tying off or excising an involved vein. He must never rest, however, until a succession of negative blood cultures assures him that the infection is at last under control.

Chemotherapy in surgical septicemia. Ever since Ehrlich's and Hata's classical work on salvarsan and syphilis, numerous research workers have striven to find some chemical agent equally effective for bacteria. During the last twenty years attention has been focused on various dyes and these have been used both locally and intra-venously with occasional apparent success. They have recently fallen into disrepute as evidence seemed to accumulate that they usually did more harm than good, acriflavine, gentian violet, and lately mercurochrome came and went and lately metaphen in a careful study has proved to be disappointing (8). In 1935 however Domagk (7) observed that a red dye called protosil had a striking effect on hemolytic streptococcus sepsis in mice and rabbits. His results were soon confirmed by Levaditi and Vaisman (12) and shortly thereafter the clinical success of this agent, as well as that of a simpler form of the substance, sulfanilamide in the treatment of hemolytic streptococcus puerperal fever was demonstrated by Colebrook (4). Its application to other types of infection with this and other organisms was tried at once and its limitations and scope have not yet been determined but it is evident that we have for the first time a medication which will greatly facilitate the treatment of hemolytic streptococcus septicemia, and recent reports indicate the possibility that similar substances will be found equally potent against related organisms. Certainly renewed interest in chemotherapy has been aroused by this truly epoch making discovery. The simpler form, sulfanilamide is now in general use. It is relatively non-toxic and is readily absorbed from the alimentary tract when taken by mouth. The dose of 1 gm. for every 20 lb. of body weight is usually sufficient to maintain a concentration of about 10 mgm. per 100 ccm. of blood but this should be determined frequently and the dose varied in order to maintain this level to control the spread of the infection through the blood stream. This medication however does not obviate the necessity for the adequate surgical approach to a distributing focus either primary or secondary in cases of hemolytic streptococcus septicemia. In very severe cases this dose may be increased by 50 or 100 per cent and should be maintained for three or four days after the clinical subsidence of the symptoms and then reduced to half the normal dose for a week or ten days. In a certain number of individuals having an idiosyncrasy for this drug toxic symptoms as evidenced by a fall of red or white cells, jaundice, high fever or delirium may necessitate abandonment of the drug in any given case.

Bacteriophage therapy in septicemia. Just as in chemotherapy there are limitations to the use of certain substances, there are very limited spheres in which bacteriophage therapy can be counted on to obtain significant results. Benefit depends also upon the most careful preparation and administration of this biological substance. Fortunately, the best field for the operation of bacteriophage is just where chemotherapy is impotent, namely, in staphylococcus aureus and in bacillus-coli infections. Favorable reports have been submitted by MacNeal (15), by Raiga (19), and others, also Longacre, Jern, and the writer have a report in the process of preparation, in which a series of cases of staphylococcus septicemia treated with bacteriophage yielded an unexpectedly high recovery. We are of the belief that other workers do not fully appreciate the importance of using potent phages. Jern and the writer (10) have pointed out a method of preparing potent phages which not only clears the culture of the causative organisms, but renders it incapable of growth when the cleared suspension is plated on blood agar. When we subject the phage to this rigid test for potency, we find that we obtain a higher percentage of cures than if we set simple clearing of the culture as the criterion of potency. Our procedure is to start with a phage potent for the organism in question diluted ten times in saline. The dose is started at 1 c cm of this one to ten dilution and the subsequent doses at hourly intervals are 2, 5, 10, 20, 30, and 40 c cm. If a reaction is obtained with any of these doses the treatment is stopped for the day and that reacting dose is repeated next day. If there is no reaction from the 108 c cm in divided doses, a single dose of 100 c cm is given next day and is repeated in twelve hours. If tolerated, this dose may be gradually raised to 500 c cm twice a day and continued until there has been a fall in temperature and a subsidence of symptoms. Again it cannot be too strongly stressed that bacteriophage therapy does not obviate the necessity for an adequate surgical approach to the primary or secondary distributing foci, which after incision should be bathed daily or twice daily with the bacteriophage.

Fixation abscess in surgical septicemia. One finds in the literature from time to time the persistent use of a "fixation" abscess advocated many years ago by both French and German authors. The injection of sterile irritants such as turpentine under the skin, which produces an abscess, generally causes an increased leucocytosis in the peripheral blood which may be over and above that called forth by the septicemia itself. How-

ever, in such cases it has not been clearly shown that this increases in any way the resistance of the patient or modifies the course of the infection, although clinical reports, such as that of Cellan-Jones (3), lead others to adopt it as a therapeutic procedure.

Animal charcoal intravenous injections. Some striking clinical results have been reported by a number of authors following the intravenous injection of aqueous suspensions of animal charcoal in cases of septicemia. St Jacques (21) has recently reported a small series of cases so treated, but does not give clear-cut evidence of its efficacy. He quotes Frazer who, he states, found by experimentation that charcoal absorbs toxin, calls forth a leucocytosis, and "stimulates the cellular elements of the reticulo-endothelial system" presumably to phagocytic action.

Serotherapy in septicemia. The serum treatment of staphylococcus and streptococcus blood infections with "immunized" horse serum has been most disappointing. Apparently it is impossible by any method yet known to immunize horses with any of the products of these organisms so as to produce any really protective antibodies, which can be passively transported in the serum to the patient and which will effectively control the spread of the infection. Recently, however, Cadham (2) has briefly presented a series of 95 cases of hemolytic streptococcus and staphylococcus-aureus septicemia with only 10 deaths, as compared with a previous mortality in similar cases in his hospital of 85 per cent. These patients were treated with rabbit serum prepared in the following manner.

Six-months old rabbits receive semi-weekly injections of different vaccines prepared from septicemic strains of both hemolytic streptococcus and staphylococcus aureus. When they are two years old they are ready for use. A series of 25 rabbits is kept thus prepared and always ready. Whenever a case of septicemia comes into the hospital, the organism is obtained from the blood, and a vaccine is made. This is injected into each of a series of several of the prepared rabbits. After twenty-four hours from 6 to 10 c cm of blood are drawn from the heart of 1 rabbit, the serum is removed, tested for sterility, and injected subcutaneously or intramuscularly into the patient. At the same time the serum from 60 to 100 c cm of blood of a compatible donor is obtained and injected. The rabbits continue to receive the patient's vaccine, and each yields in turn 6 to 10 c cm of heart blood, the serum of which is given to the patient. The average number of these combined injections is four and the most ten. Cad-

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It may be very difficult to locate osteomyelitis or differentiate it from suppurative arthritis, particularly in the region of the hip joint. Usually the severe pain, the local tenderness, and later the swelling over the bone reveal the focus there. Suppurative foci in joints are more easily found by a routine examination of all of the joints. Unless the capsule has been broken, the intense pain on movement is almost a pathognomonic sign.

After the primary focus has been found and properly excised or incised and drained, the patient should be examined completely daily for evidence of metastatic lesions. These may be revealed in a co-operative patient by swelling pain and tenderness but if the patient's sensorium has been dulled by his illness or by sedatives, these areas can often be found only by careful palpation to determine induration, swelling, or fluctuation. Redness may or may not be present. Occasionally the patient tries to hide the metastatic focus in order to avoid another operation, but all such approachable lesions must be widely opened and adequately drained to prevent, if possible, such foci from becoming in their turn distributing foci with suppurative phlebitis in the neighboring vein and all of the dangers attached thereto.

The criterion of adequacy in the surgical treatment of either the primary or secondary foci in septicemia is the subsequent presence or absence of the organisms in the blood. If the distribution can be arrested, the organisms will rapidly disappear from the blood. If they continue, the surgeon is faced with the necessity of finding another focus or of tying off or excising an involved vein. He must never rest, however, until a succession of negative blood cultures assures him that the infection is at last under control.

Chemotherapy in surgical septicemia. Ever since Ehrlich's and Hata's classical work on salvarsan and syphilis, numerous research workers have striven to find some chemical agent equally effective for bacteria. During the last twenty years attention has been focused on various dyes and these have been used both locally and intravenously with occasional apparent success. They have recently fallen into disrepute as evidence seemed to accumulate that they usually did more harm than good, acriflavine, gentian violet and lately mercurochrome came and went, and lately metaphen in a careful study has proved to be disappointing (8). In 1935 however, Domag (7) observed that a red dye called prontosil had a striking effect on hemolytic streptococcus sepsis in mice and rabbits. His results were soon confirmed by Levaditi and Vaisman (11), and shortly thereafter the clinical success of this agent, as well as that of a simpler form of the substance, sulfanilamide, in the treatment of hemolytic streptococcus puerperal fever was demonstrated by Colebrook (4). Its application to other types of infection with this and other organisms was tried at once and its limitations and scope have not yet been determined, but it is evident that we have for the first time a medication which will greatly facilitate the treatment of hemolytic streptococcus septicemia, and recent reports indicate the possibility that similar substances will be found equally potent against related organisms. Certainly renewed interest in chemotherapy has been aroused by this truly epoch making discovery. The simpler form, sulfanilamide, is now in general use. It is relatively non-toxic and is readily absorbed from the alimentary tract when taken by mouth. The dose of 1 gm. for every 10 lb. of body weight is usually sufficient to maintain a concentration of about 10 mgm. per 100 c.c.m. of blood but this should be determined frequently and the dose varied in order to maintain this level to control the spread of the infection through the blood stream. This medication however, does not obviate the necessity for the adequate surgical approach to a distributing focus either primary or secondary in cases of hemolytic streptococcus septicemia. In very severe cases this dose may be increased by 40 or 100 per cent and should be maintained for three or four days after the clinical subsidence of the symptoms, and then reduced to half the normal dose for a week or ten days. In a certain number of individuals having an idiosyncrasy for this drug toxic symptoms as evidenced by a fall of red or white cells, jaundice, high fever or delirium may necessitate abandonment of the drug in any given case.

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ham is of the opinion that the rabbits prepared by preliminary injections very rapidly produce a potent antiserum containing antibodies, for which the additional human serum yields complement. If these remarkable results can be confirmed there is hope for future success in this field.

Lyons (13) has recently suggested the possibility of stimulating antibacterial as well as antitoxic substances against the staphylococcus aureus by the injection of vaccine made from very young capsulated forms. Whether or not this procedure will be able to increase the potency of serum further laboratory and clinical experience will have to determine. The injection of similar vaccine into patients who are suffering from a prolonged septicemia has also been suggested. Likewise an attempt has been made by Bergey and his associates (1) to stimulate the production of staphylococcus antitoxin in blood donors by the intracutaneous injection of increasing concentrations of toxin until there is no longer any skin reaction to the undiluted material. When the reaction no longer occurs they believe it is indicated that the donor has developed antitoxin and that his serum will be efficacious when given to a patient with staphylococcus septicemia. In some cases they also have thought that they were able to develop a potent antitoxin in the patient during the course of the infection by a similar series of intracutaneous injections of toxin.

Transfusion of blood in surgical septicemias. Kolmer (11), Unger (23), Stetson (22) and others all favor the frequent administration of small transfusions in cases of septicemia. They claim, quite without clear proof of their existence, that immune substances are thus transferred from the donor to the patient. Stetson's figures of 10 deaths in 19 cases of hemolytic streptococcus septicemia and 9 deaths in 12 patients with staphylococcus aureus septicemia are not particularly convincing as to its efficacy. Unger reported only 9 recoveries in 42 cases of septicemia treated with repeated direct transfusions from normal donors and attempted to improve these figures by immunizing his donors by the injection of the homologous or heterologous strains of organisms. However his recoveries were not materially increased thereby and frequently the donors showed no evidence of having developed any immune substances. Almoth Wright (24) was not satisfied with the results of ordinary transfusion and proposed his non specific immunotransfusion prepared by the addition of certain non specific vaccines to the blood *in vitro* before its administration. A number of other workers have followed this suggestion with variable success. Crocker

Valentine, and Brody (5) express their own feelings with regard to it by saying that 'unless there is adequate natural or surgically established drainage of the foci of infection the beneficial effect of the non specific immunotransfusions is only transitory.'

Recent work by Lyons (13) indicates perhaps why it is that occasionally brilliant results are obtained by transfusion in cases of hemolytic streptococcus septicemia. He has been able to determine by a special technique that about 1 donor in 10 or 20 will have potent natural opsonins for the patient's organism and the donor's leucocytes will show a high degree of phagocytic power. He claims that a selection of such a donor will yield much more benefit than the blood of the average donor or of one who has been artificially immunized. The difficulties of obtaining a large number of donors to test for each case and the exact requirements of the technique render this method of selecting the donor impossible in most institutions at the present time. The method has not been applied to other types of septicemia as far as I know.

Even though, from an immunological standpoint transfusion is not what its chief advocates would have us believe, it has its indications in cases in which there is a real reduction of red cells and hemoglobin. Neuhof (17), Scott (20) and the writer all feel that its chief value lies in this field. Even for this anemia however one adequate surgical approach to the distributing focus is worth many transfusions.

For the most part the evaluation of the reports of chemotherapy, serotherapy, phagotherapy, and transfusion in septicemia is difficult because usually no details of the surgical procedures are given in the cases so treated. It would require a very careful unbiased analysis of each individual case of a large series to weigh and measure the rôle played by any one therapeutic measure. It is generally agreed however that the surgical attack on the distributing focus is of prime importance, therefore I end this paper as it began by saying that in a case of septicemia due to pyogenic or necrotizing organisms it is the surgeon's responsibility to locate the distributing focus and, if possible to remove, drain or isolate it. The present high mortality of septicemia is a challenge to our profession.

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Fig 1 Torus palatinus The tumor has developed slowly over a period of many years (From Internat J Orthodont, & Oral Surg, 1937, 23 194)

line of the hard palate. When expanding these growths form a lobular, pedunculated tumor covered by mucosa, which in some form or other is seen in from 5 to 10 per cent of all white adults. Thoma (113) has written an article describing the development of this tumor, which when very large interferes with eating and speech, and hinders the construction of a well fitting denture. Several types are illustrated and the technique of excision is described.

Fibro-osteoma. This is a benign osteogenic tumor. It has heretofore been described under the name of osteofibroma, ossifying fibroma, localized osteitis fibrosa, and localized osteodystrophia. It is a slow-growing tumor, which transforms the spongiosa, expands the bone, causes facial deformity, and changes the architectural arrangement of the bone trabeculae. The marrow becomes fibrous and shows evidence of cellular activity. It often occurs in the second or third decade of life, and deformity or asymmetry of the face is a prominent complaint of the patient.

Thoma (116) distinguishes the following types:

1. Ossifying fibroma in which the fibrous tissue is formed in excess and bone trabeculae are rare [Example: Phemister and Grimson (74), Fig 31]

2. Fibro-osteoma in which the spongiosa is represented by well calcified irregular bone trabeculae, and the marrow spaces are filled with fibrous tissue often containing some osteoclasts, besides active osteoblasts in very large numbers. This is the common type.

- a. Fibro-osteoid-osteoma in which the newly formed bone trabeculae are poorly calcified (Figs 2 and 3).

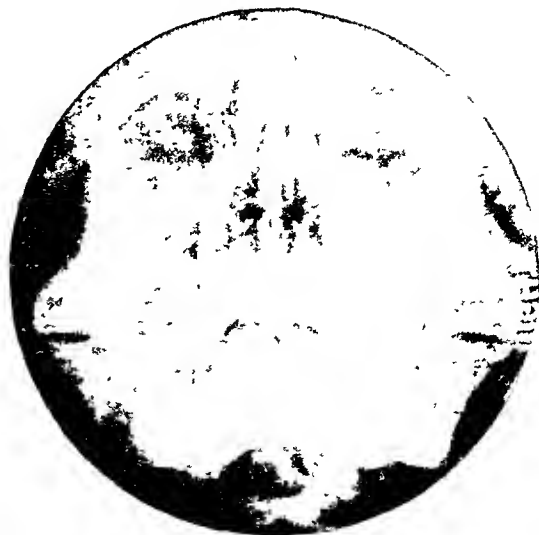


Fig 2 Fibro-osteoid osteoma. Roentgen picture of a girl aged sixteen, showing radiopacity of maxillary sinus extending into the malar bone (From J Am Dent A, 1938, 25 750)

- b. Fibrosclerosing osteoma in which well calcified bone is formed in excess and fibrous marrow is very scarce [Example: Thoma (116) Fig 20.]

Worth (123) distinguishes three types which he describes under the name of localized osteitis fibrosa. The most common type, he writes, is found usually in the maxilla of young patients and results in swelling of the molar and premolar regions. In the roentgenogram the newly formed bone has a homogeneous density and presents a stippled appearance. At operation it is found to be quite soft and easily removed. The reviewer classifies this type as fibro-osteoid-osteoma. Another type, occurring in older patients, resembles a mass of new bone arising from the alveolar border of the maxilla, extending downward, and interfering with the closing of the mouth. The bone is dense and rather structureless, hard at operation, and radiopaque in x-ray examination. The third type occurs in the mandible which shows considerable increase in depth of the bone, and in the roentgen picture varies a good deal from the "ground glass" to the "granular" or stippled appearance. There may or may not be areas of rarefaction present. It is usually found to be hard at operation.

Phemister and Grimson of Chicago (74) reported 13 cases in an article already reviewed (9a). They observed that the tumors are slow-

TUMORS OF THE MOUTH AND JAWS

Collective Review

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FOREWORD

THE oncologist is confronted with a very complex problem when attempting to classify oral tumors. A large number of tumors arise from the soft tissues of the oral cavity or the neighboring glands, some form from the cellular elements of the jaws, while still others originate from enclaved cell rests of the embryonic chondroskeleton, or structures derived from tooth formation.

In my text *Clinical Pathology of the Jaws* (197), I have adapted for the tumors of the mouth and jaws the simplified classification established by the Registry of Bone Sarcoma for bone tumors in general, and except for minor changes this classification has been very satisfactory. It will serve me to discuss the collected material for this review in a comprehensive manner.

I TUMORS OF OSTEOGENIC ORIGIN

Osteogenic tumors of the jaws like those of the rest of the skeleton, are derived from osteogenic tissue that is cells and ancestors of cells which when fully differentiated, are known as osteoblasts. Slowly growing benign tumors generally are made up of cells all showing the same stage of development so the pure myxoma, chondroma, and osteoma result.

Two cases of myxoma are reported: one by the New York Institute of Clinical Oral Pathology (70) and the other by Salama of England (89). The first occurred in a woman aged twenty-five who complained of a dull pain in the region of the right maxillary first molar. A swelling of 1 1/2 cm in diameter could be seen bulging buccally. On x-ray examination a honey-combed osteolytic change was noticed which was not diagnostic; giant-cell tumor, polycystic adamantinoma, osteitis fibrosa, myxoma and central fibroma were considered. At operation the lesion was found to extend into the molar process and to be made up of a yellowish white tissue which on microscopic examination showed a pure myxoma replacing the spongiosa of the alveolar bone completely. The second case involved one side of the mandible of

a man aged twenty-seven. It was associated with a painful tooth which was exfoliated. The x-ray showed a diffuse bony rarefaction of the honey-comb type in the horizontal and ascending ramus which on microscopic examination was found to be due to osteoclastic resorption of bone caused by a fibroma in which marked myxomatous changes were seen. The right mandible was excised.

Chondromas, although not uncommon were not reported this year. Several articles dealing with various forms of osteoma have been published.

Multiple osteomas. Osteomas may occur in multiple form. Ehrenfried (1917) described a hereditary deforming chondroplasia with multiple exostoses, of which about 600 cases have been reported, 2 or 3 affecting the skull. A case of multiple osteomas involving several bones of the skeleton was recently described by Fennel (24) of Honolulu, his patient was known as 'Knobby Willy' or the 'exostotic kid'. This case is of special interest because although the patient had had these exostoses ever since he could remember, one developed into osteogenic sarcoma at the age of forty-five. A case of multiple mesenchymal tumors, mostly osteomas, involving principally the skull has been published by Thoma (112). The patient aged eighteen of Italian descent, complained of pressure against his ear when opening his jaw. This was due to a large osteoma attached to the ramus of the mandible near the neck of the condyle. Other osteomas were attached to the mastoid process, several to the lower border of the mandible on each side, and one occupied a large part of the right maxillary sinus. Pathological examination of the excised exuberant odontomas showed them to belong to the classification of osteoma durum.

Osteoma. Solitary osteomas may be made up of compact bone (osteoma durum) or may contain a spongiosa in the center (osteoma spongiosum); they may be peripheral or central in location. A special form of osteoma is the torus palatinus which develops on the roof of the mouth (Fig. 1). It is looked on by some as an exostosis because it develops as two bony outgrowths at the median

growth of polyhedral-shaped cells without clearly defined cellular limits. Some of these cells appeared to form small lacunar spaces with the nuclei occupying the periphery of the space. This tissue gradually differentiated into cartilaginous tissue. Numerous mitotic figures were present.

The second case, No 1571, occurred in a man aged twenty-nine. He noticed a lump on the right side of the jaw in the molar area. Two teeth and a retained root had been extracted three or four years before. The lump had gradually become larger. Roentgen examination of the excised right mandible showed a remarkable bony growth extending about 1.5 cm from the inner and outer side of the mandible and from the lower border. This new bone was laid down in striæ perpendicular to the shaft, producing in the roentgenogram the characteristic sun-ray effect of osteogenic sarcoma. There were also shown marked malignant changes in the bone, and roentgen examination of the face revealed metastases to the left side of the maxilla, other bones of the face, and the lungs. Pathological examination showed typical cartilage and osteoid tissue in a matrix of spindle cells varying in size and arrangement and containing numerous mitotic figures. Multinucleated giant cells were frequent. The tumor cells invaded the muscle bundles attached to the jaw. The patient died three months after operation.

II TUMORS OF ODONTOGENIC ORIGIN

Odontogenic tumors, derived from tissue of the tooth germ during tooth development or from cellular remnants retained in the jaw, are very common, and a great many articles are at hand which deal specifically with these tumors. Odontogenic tumors may involve only the dental epithelium, when follicular cysts and adamantinoblastomas result, if the mesenchymal tissue is involved, soft and hard odontomas form.

Follicular Cysts While the radicular cyst derived from an epitheliated apical granuloma is a lesion of infectious origin, we find more and more statements supporting the contention that the follicular cyst which is derived from enamel-organ epithelium is closely related to the adamantinoblastoma, and therefore should be classified as a tumor. The British writers for a long time have classified cysts as odontomes, which is evidenced in the recent article by Sprawson (100) on odontomes, and another by Worth (123) abstracted in *Surg, Gynec & Obst.*, 1937, 65-97. Sprawson states that while chemical irritation of the accumulating cystic fluid may be a prime factor in the proliferation of the epithelial lining of the cyst, this is no argument against its inclusion as a



Fig 3 Fibro-osteoid osteoma. Photomicrograph of bone excised from maxilla of patient shown in Figure 2 (From *J Am Dent A & Dental Cosmos*, 1938, 25-750)

neoplasm since many investigators have shown that pure chemical substances used experimentally produce tumors regarded as true neoplasms, such as sarcoma and carcinoma. The French also classify odontogenic cysts as odontomas, Despons (20), abstracted in *Surg, Gynec & Obst.*, 1937, 65-201, for example, points out that parodontal cysts which form at the side of a tooth from the enamel organ or from an epithelial sprout given off from it, behave exactly like tumors, because they have a tendency to develop progressively and produce deformity of neighboring cavities. He also points out that such cysts may become multilocular and have the tendency to recur after incomplete operation, because of proliferations which enter the adjoining bone.

The German point of view is stated in an analysis by Hauenstein (38) based on a study of the vast material at the University clinic in Leipzig. Hauenstein describes 16 selected cases which show that both odontogenic cysts and adamantinoblastomas form from the primitive oral epithelium and are therefore closely related to each other. Variations in tumor formation, he concludes, are due to the degree to which the parental cells have differentiated, which explains why many borderline cases occur that cannot be easily classified.

Since Cahn of New York (13) published his article, *The Dentigerous Cyst as a Potential Adamantinoma*, in 1933, more cases showing the transition of an odontogenic cyst to an adamantinoblastoma have been reported. Thoma and Carpenter of Boston (118) reported a case in which small cystic areas were found at the periph-

growing and when starting in childhood tend to become stationary in adult life. They state that the lesion appears to be a true neoplasm and not a form of osteitis fibrosa hyperostosis or chronic inflammation. In 3 of their cases it consisted largely of fibrous tissue in various degrees of maturation with ossification proceeding slowly. In 12 the tumor consisted largely of cancellous bone and fibrous marrow. There was myxomatous tissue present in 3, and occasional small islands rich in giant cells in 2. No case showed evidence of malignancy.

Charbonnel and Masé (15) reported 1 case, and Gullifer of Boston (35), in an article dealing with this type of tumor showed illustrations of 3 cases: 2 of the maxilla and 1 with lesions in the mandible; all were of the fibro-osteoma type, but were listed as localized osteitis fibrosa.

According to the reported cases the disease is more common in the maxilla than the mandible, occasionally occurs in both maxilla and mandible (Phemister and Grimson) and may form multiple lesions in one bone (Gullifer). In the upper jaw the disease may be limited to the anterior part, or the tuberosity, but there is a typical lesion which obliterates the maxillary sinus, causes expansion of the bone in the canine fossa and invades and expands the malar bone. The lower border of the orbit may be thickened and the eye pushed to a higher level. Such a case is well illustrated in Thoma's article (116) Figures 16 and 17. The palate may bulge into the mouth in very extensive cases as shown in Figure 4 of Phemister and Grimson's article (74). The nose is not involved, which is of importance in differentiating diagnostically from the diffuse hyperostosis and leontiasis ossea in which obliteration of the nasal meatus is an early symptom. In the lower jaw expansion of the bone without definite demarcation is an early roentgen sign. Differentiation from osteogenic or other cysts presents no special difficulty because in fibro-osteoma there is no parchment like condition of the swelling and the x rays do not show the well defined cystic margin but thinning out of the cortex, distortion of the mandibular canal (Thoma (116) Figs 10 and 14) and obliteration of the outline of the maxillary sinus are characteristic signs. There is no periosteal bone formation. In some roentgen pictures the spongiosa is so changed that a typical stippling may be seen which reminds one of the texture of an orange peel (Worth (123) Fig 18). The relation of the teeth to the tumor plays no direct part in the disease. Trauma, caries of the teeth and extraction or other infections are mentioned in the history of most cases.

The blood calcium and phosphorus are generally normal and the disease, though often termed localized osteitis fibrosa, is not in any way related to generalized osteitis fibrosa of the hyperparathyroid type. Paget's disease or benign giant-cell tumor. The histological picture shows a great variation in the amount of fibrous and osseous tissue. Some cases show areas of myxomatous change and the presence of foreign body giant cells. There is no round cell inflammatory infiltration except in cases complicated by dental infection.

The prognosis generally is favorable, no cases have been reported which have undergone sarcomatous changes. The growth is usually slow; there is no enlargement of the lymph glands and the general health of the patient is good. The tumor generally not being circumscribed, is not always completely removed and therefore shows the tendency to recur.

Treatment should be conservative except in early circumscribed cases when the total excision is possible. In diffuse involvement of the bone when large parts of the jaw are involved conservative operation is advised. The authors referred to agree with earlier writers on the subject (Hippel, Blum, Furedy) that massive resection with its disfiguring results is not justified. Biopsy should be performed to establish definitely the benign nature of the disease. The operation should consist of removing as much of the tumor as possible without running the risk of a poor esthetic result. This is followed by moderate irradiation up to 3,000 roentgen units in order to control portions of the tumor not removed at operation. In spite of this the tumor may continue to grow and require a secondary operation later or finally complete resection.

Osteogenic sarcoma. No reports of osteogenic sarcoma were found in the literature of 1936 and 1937. Two new cases however were reported to the Registry of Bone Sarcoma and kindly placed at my disposal for study. The first Case No. 1896 occurred in a woman aged twenty-three who first discovered a lump on the outside of her right lower jaw. This was hard fixed and the size of a marble. It started to grow more rapidly after it was excised. Growth was accelerated by several minor operations, extraction of a tooth, excision of the growth and radium treatment. Roentgen examination showed an expansible type of lesion in the right jaw extending from the region of the first premolar back to the third molar and beyond and causing an irregularity of the bony trabeculae. Pathological examination showed dense fibrous tissue enclosing a diffuse



Fig 4 Monocystic adamantinoblastoma (W H Hyde) Roentgen picture shows cystic area in ramus adjacent to third molar, from the epithelial organ of which the tumor must have formed



Fig 5 Monocystic adamantinoblastoma, photomicrograph of case shown in Figure 4

outline of the lesion. This is of importance especially in the maxilla where the septa of the maxillary sinus are often mistaken for the walls of a cyst. I (117) have recommended the use of lipiodol for this purpose and found it a great help in difficult cases.

Other cystic lesions must be differentiated, such as, first of all, the traumatic cyst which occurs in adolescence from trauma insufficient to cause fracture but producing intra-osseous hemorrhage. Such cysts have been described by Ivy and Curtis of Philadelphia (42) and by Smith and Barrows of Providence (99). Another cyst which gives difficulty in diagnosis is the facial cleft or fissural cyst caused by enclaved epithelium at the junction of the embryonic facial processes. This has been described by Thoma of Boston (114) and by Stafne, Austin, and Gardner (103) who point out that when large it may be difficult to distinguish it from an odontogenic cyst. The incisive canal cyst may also attain large size, when it is difficult to differentiate it from cysts of dental origin, as demonstrated by a case reported by Cohen and Levine of Boston (17).

In treatment of follicular cysts complete excision of the cyst sac is advised, as the tissue must be considered a potential adamantinoblastoma. Leo Winter (122) in an article on cysts of the jaws discusses the methods of treatment and stresses the importance of differential diagnosis of cysts and adamantinoma, particularly in

cases of multilocular tumors. He recommends complete enucleation of the cyst. For large cysts of the upper jaw encroaching upon the maxillary sinus, Schupfer (93) prefers the rhinological approach because little after-treatment is necessary, a large oral opening into the cyst, such as results from the Parlsch operation, is avoided, and the early replacement of teeth by means of a denture is possible. I, personally, prefer excision of the cyst sac by means of an oral operation, removal of the bony partition separating the cyst from the sinus, and, if there is no infection present, closure of the oral opening by means of a large and liberal palatal mucosa flap. Rosedale and Koepf (86) advise the same treatment with a large-sized window under the inferior turbinate to connect the cystic cavity with the nose and establish adequate drainage. This procedure is indicated particularly in case of infected uninvolved parts of the maxillary sinus. The window also facilitates irrigation.

Wuest (124) in a dissertation on mandibular cysts states that in cases of large cysts there is danger of fracture of the jaw, as it is difficult to determine its thickness with the x-rays. He recommends the use of a splint constructed and applied to the teeth previous to the operation. The spontaneous cure of a cystic tumor in the mandible after extraction of a tooth is reported by Lafite-Dupont (51). The patient, sixty-eight years old, presented a carious aching mandibular six-year molar which was extracted. The so-called cyst, however, was a gingival swelling of the size of a small walnut, no doubt a chronic inflammatory periosteal swelling rather than a true bone cyst.

Maccaferri (57) reports a case with two dentigerous cysts in which the teeth (six-year molars) erupted within a year after operation. The cyst sac was excised according to the method of

ery of an odontogenic cyst. On pathological examination some contained small cyst membranes while others contained adamantinoblastoma follicles. Thoma and Proctor (119) also reported a case of a mandibular cyst which after excision was found to present mural thickenings in which an adamantinoblastoma was found to be developing.

Maccaferri (56) who reports on 32 cases of follicular cysts treated at the clinic for mouth disease at Bologna gives the following statistical information regarding relative occurrence: 20 cases were found in the mandible, 12 in the maxilla, 10 cysts originating from the third molar (6 maxillary, 4 mandibular), 21 from the canine teeth (8 maxillary, 3 mandibular), 7 from premolars (3 maxillary, 4 mandibular), 3 from supernumerary teeth and 1 from an incisor. The writer stresses the importance of determining whether the cyst is infected.

Clinical symptoms in some cases are absent. Facial deformity or nerve symptoms may be complained of by the patient. Fiquet and Decouix of Paris (77) report a case of dentigerous cyst in the anterior part of the mandible in a twenty-nine-year-old patient, which caused headaches over a period of twenty years. To cure these frontal headaches the tonsils were removed and treatment was given for a suppurative otitis media. Blood examinations and lumbar punctures gave no clue to the condition. Only later when x-ray pictures were made of the sinuses was a cyst discovered in the lower jaw. Excision resulted in complete relief of the pain that had persisted for so many years. Lehmann (53) describes similar cases with pains in the back and left side of the head of many years duration due to large mandibular cysts. The pains were completely relieved two months after operation.

Grandi (34) states that large cysts of the mandible may cause paresthesia. This is due to pressure and not to destruction of the inferior alveolar nerve except in cases of pathological fracture when the nerve and vessels may be torn. In such cases the teeth lose their sensory supply but do not lose the blood supply because of collateral circulation. Grandi recommends careful dissection of the cyst membrane to prevent injury to the nerve.

Deformity due to follicular cyst is not so common because expansion of the cyst occurs first inside the bone. Very large cysts, however, may produce an asymmetrical swelling of the face. Such a case was reported by Bloom of Tsuyuanfu (10) who excised a dentigerous cyst in a Chinese woman aged nineteen which occurred in the maxil-

ary sinus expanded the bone extended to the floor of the orbit and the wall of the right nasal cavity displaced the septum, and caused a bulging of the right half of the palate. It contained 100 c.c.m. of clear fluid with cholesterol crystals. The tooth found in and probably causing the cyst was located below the infra-orbital margin.

Rosedale and Koepf, Buffalo, (86) describe other interesting cases affecting the maxilla stating that the cysts may perforate the outer cortical plate in the canine fossa and cause bulging of the upper lip, and may extend into the opposite maxilla through the anterior alveolar process and the palate. Cysts located in the hard palate may cause elevation of the floor of the nose and erosion of the palatal plate which then presents a boggy fluctuant mass. Encroachment on the maxillary sinus causes displacement of the naso-antral wall medially, and in such cases the cyst may obliterate the sinus.

Infection may complicate the picture. Rosedale and Koepf report 3 follicular cysts which became infected. They were painful and 1 had a history of several exacerbations. Pus escaped when the swelling was incised. In a colored man aged thirty-four the condition was accompanied by fever of 99.4° F. The white blood count was 11,200.

The differential diagnosis between follicular cyst and adamantinoma is not always easy. When the roentgen film shows a monocystic defect diagnosis of follicular cyst is not certain, even though the cyst contains a tooth (dentigerous cyst). This is brought out in an article by Oesterreich (71) who points out that 3 cases roentgenographically diagnosed as cysts proved on histological examination to be adamantinomas. Jacobs (45) described such a case and I have received 2 cases this year for pathological examination which in the roentgen picture could be diagnosed as dentigerous cysts, but which proved to be monocystic adamantinomas. Fig. 4 shows the roentgenogram of one of these cases referred to me by Dr. Hyde of Brooklyn, New York for diagnosis. The photomicrograph Fig. 5 shows the pathology: a solid adamantinoblastoma.

Schupfer (92) recommends puncture of the cyst with withdrawal of the cyst fluid by means of a syringe and replacement of the fluid by a radiopaque fluid for the purpose of identification in the x-ray examination. He advises the use of thorotrast. The aspiration of the cyst fluid is of course a well recognized procedure in the differential diagnosis of cysts; the use of a radiopaque substance for injection into the cyst lumen often gives valuable information regarding the size and

Adamantinoblastoma The adamantinoblastoma forms either directly from the epithelium of the enamel organ, or indirectly from the oral epithelium, from remnants of the dental lamina, or from follicular cysts. It never produces calcified tissue and for this reason the name adamantinoma is somewhat misleading. It may produce a monocystic bone lesion or a polycystic tumor. Monocystic tumors resembling follicular or dentigerous cysts have already been mentioned, and so have odontogenic cysts, which on microscopic examination showed the formation of an adamantinoblastoma in the cyst sac. Such cysts may ultimately become filled with tumor tissue and become solid adamantinoblastomas or, if the epithelium proliferates peripherally, they may form multilocular tumors.

Ivy and Curtis of Philadelphia (43) quote Churchill (16) who pointed out that in microscopic diagnosis of follicular cysts proliferating epithelium may be seen surrounding islands of connective tissue, these are pseudofollicles and the cyst membranes containing them are not potential adamantinomas. It is important to differentiate such structures from true follicles, which contain stellate epithelial cells and no blood capillaries such as are seen in connective tissue. The writers of the article, however, point out that the clinical course of the aberrant follicular cyst resembles very closely that of the adamantinoblastoma and therefore for practical purposes the treatment is the same. Kotany (56) of Vienna describes a very small cyst situated between the mandibular second premolar and the first molar of a girl aged nineteen, which on microscopic examination was found to be an adamantinoma. He stresses the importance of having a microscopic examination made of all cystic membranes.

Hauenstein of Leipzig (38), in an excellent article, describes a number of cases which demonstrate the importance of histological examination. Two dentigerous cysts which were found to be adamantinomas on microscopic examination are described. In other cases in which the clinical and roentgen diagnosis favored adamantinoblastoma on account of size, shape, and polycystic roentgen appearance of the lesion, the tissue on examination proved the lesion to contain the ordinary epitheliated connective tissue sac of a multilocular follicular cyst. This writer says he disagrees with Axhausen, who demands biopsy examination in all cases of multilocular tumors and advises excision of large pieces of tissue for this purpose. Hauenstein believes in conservative treatment for adamantinoma as well as for cysts and therefore his treatment is essentially the same

for both tumors, if they are well encapsulated and can be easily enucleated. The tendency toward recurrence after operation should lead us to excise the tumors carefully and thoroughly rather than influence us to advise radical treatment.

Hauenstein states that careful histological study of the excised tissue is advised because of the many characteristics of this tumor and the changes it may undergo. The fact is stressed that the tumor forms from epithelium, which in its development has many possibilities and may differentiate into glandular as well as dental structures, and even may, though rarely, undergo carcinomatous changes. Robinson (84) made a very careful histological study of 16 cases of ameloblastomas, he preferred this name to adamantinoblastoma. He concludes from his observations that the various stages of development of the enamel organ may be represented up to the point at which the normal ameloblast assumes function. From this point on a divergent development takes place. In the normal enamel organ the cells generate enamel, but in the tumor the ameloblastic follicles degenerate to a non-functional cystic mass. He believes that the solid and cystic adamantinoblastomas represent stages of development rather than distinct types of tumors. A case of adeno-adamantinoblastoma which developed on the lingual side of the ramus as a peripheral tumor without involving the bone is described. It was composed of squamous, glandular, and enamel-organ epithelium. Gullifer of Boston (36) also described a peripheral tumor resembling an adamantinoma histologically. It formed in the submucosa of the gingiva in the anterior part of both maxilla and mandible. An adamantinoblastoma with cavernous hemangioma was reported by Oesterreich of Leipzig (71), who also cites other cases of mistaken diagnosis made by means of clinical and roentgen investigation. On histological examination in 3 cases the cysts proved to be adamantinoblastomas, and in 2 cases the adamantinoma and osteoma, respectively, turned out to be central giant-cell tumors.

The question of malignancy is discussed by Robinson of Buffalo (85), who in reviewing all the reported cases of adamantinoblastoma found a few scattered cases which were suggestive histologically of malignant growth, a metaplasia to sarcoma or carcinoma. Among 379 reported cases 17 presented evidence of malignancy. In 9, metastases which proved to be of adamantinoblastomatous nature were observed. Seven cases were classified by the writer reporting them as (1) sarcoma ameloblasticum, 3 cases, and (2) carcinoma ameloblasticum, 4 cases. This demon-

Sprawson the teeth being left in position. Such a case was also reported by Thoma (108) and operated upon in a similar manner with excellent results. Maccaferri recommends this procedure for the treatment of dentigerous cysts in the following cases:

- 1 If the cysts are still small
- 2 If the cyst is in the alveolar process close to the surface, and if the involved tooth is not greatly transposed and has roots that are well developed
- 3 If the affected person is young
- 4 If the cyst is not infected

Matolefsky (63) of Budapest recommends for large cysts the use of a tibial bone graft transplanted with periosteum to obliterate more rapidly the cystic cavity. Of 45 cases, 43 healed by primary intention, in 2 the transplant was expelled. The follow up roentgen examination showed that in young patients the transplant was rebuilt into the jaw in from eight to ten months while in older patients it took as much as three years. One of the advantages of this procedure is the protection of the jaw against fracture.

Multiple follicular cysts. Follicular cysts are quite often found in multiple form. A large number of cysts may develop in one place from one anlage. Such cases are quite common. Harpole of Atlanta, Georgia (37) reported several unusual cysts and described one of this type. It was a dentigerous cyst which occurred in a female negro aged twenty six and involved the third molar. It was multilocular in type and spread from the third molar region into the ramus.

Less common are multiple cysts in one jaw or in both jaws formed in various locations each from a separate anlage. Such cases represent a predisposition to cyst formation which may be due to genetic factors. Maccaferri (57) reported a case of bilateral cysts in a boy aged seven. They were dentigerous cysts formed by the first mandibular molars. Seeman of Nashville, Tennessee (94) treated a male patient aged sixteen with two maxillary and two mandibular cysts. They were dentigerous, one containing a third molar, the other three each a second and third molar. Bennett of Tucson, Arizona (7) describes a similar case but of more extensive involvement. Cysts were found by roentgen diagnosis as follows: (1) dentigerous cyst from the left maxillary cuspid, (2) dentigerous cyst from the right maxillary cuspid, (3) cyst involving the antrum from a molar tooth, (4) cyst involving the anterior part of the mandible extending from the second molar on the right around the symphysis to the first molar on the left and containing a retained in-

cisor, and (5) cyst at the angle of the jaw involving half the ramus and the third molar. Physical examination was essentially negative, the cysts were excised at different times. Worth (124) points out that in some cases there is a familial tendency to the production of odontogenic cysts.

What might be called 'cystomatosis' is a condition which has been described by Jones of Kingston, Ontario, Canada, (47) under the title 'Case of Familial Multilocular Cystic Disease'. The patients observed by Jones were 4 of 5 children of a Hebrew family, descendants from Russian immigrants. The disease set in after the second year of life and caused a bilateral painless swelling of both upper and lower jaws, accompanied by a chronic hyperplastic disorder of the submaxillary and cervical lymph glands. The protuberance of the cheeks and jaws and upward turning of the eyes associated with it gave the children a cherubic appearance which prompted Jones to coin the word 'cherubism' to describe the faces produced by the disorder. The disease is caused by a polycystic condition involving both the upper and lower jaws completely. As some of the patients were under observation for six years it was possible to demonstrate by means of roentgen examination the progressive enlargement of the cyst causing marked expansion of the bones. A more complete abstract of this case has been printed in an issue of this journal (*Surg Gynec & Obst* 1933 67 219).

Jones also cites another case, the description of which was put at his disposal by P. J. Thomas of Savannah, Georgia. The cyst occurred in a boy aged eleven and caused a similar disorder of both jaws but did not involve the lymph gland. It showed however a marked hereditary characteristic, a similar type of cyst having occurred through five generations. A genetic chart is included. There was no pathological examination of these cysts and the diagnosis was based on the roentgen findings. Other probable diagnoses mentioned by the writer cannot therefore be excluded definitely, the diagnoses under consideration were cystic adamantinoma and fibrocystic disease of the jaws. It is interesting to know that a case of similar roentgen appearance has been reported by Salama of England (89). The growth involved only one side of the mandible and ramus, the maxilla being normal. It was reported as a case of multilocular cyst and a third molar was found in the ramus near the mandibular notch. A microscopic examination was made however both before and after the operation and the final diagnosis was fibroma with marked myxomatous changes.

Many of the German writers believe in biopsy examination in order that the type of treatment can be determined for each case.

Reinmoeller of Rostock (82) points out that most of the cases described in the literature show a slow gradual development, but that a fairly radical excision performed when the tumor is small may save the patient recurrences, and repeated and more serious operations. He also says that there are cases on record in which the tumor recurred even though radical resection was performed early. In one case the recurrence occurred after forty-three years, in another after forty-five.

Hauenstein believes that a difference should be made in the treatment of well encapsulated tumors, and of those that show malignant tendencies. Lange of Koenigsberg (52) represents the German point of view, championed by Axhausen, who advises careful biopsy examination to indicate the method of treatment. This not only facilitates the establishment of a differential diagnosis from other central tumors of the jaws which may simulate the roentgen appearance of an adamantinoblastoma, but helps to detect malignant tendencies in both the tumor epithelium and the connective-tissue stroma of the latter. The importance of careful differential diagnosis is also pointed out by Kotany (50) of Vienna who represents the school of Pichler. The routine procedure for adamantinoma in the surgical clinic (jaw department) of the University of Vienna is conservative, because of the belief that serious and mutilating operations are only justifiable as a last resort in the treatment of a benign tumor such as adamantinoma. The removal is by thorough curettage followed by repeated exposure to radium and periodic control with x-rays. Ivy and Curtis (42) point out that it is very important for every particle of tumor tissue to be removed, otherwise recurrences will surely follow. In early cases they believe it is sometimes possible to obtain a cure by enucleation, especially if the tumor is small and surrounded by well defined bony walls. However, in such cases recurrences are frequent, and finally a complete resection must be performed to secure a cure. When the tumor is large with irregular extension in the bone and perforation of the cortical plate, they feel that complete resection is indicated as the initial treatment. This has been advocated by Simmons (98) of Boston and Rosenthal (87) of Leipzig. Ivy and Curtis report that of 15 patients in whom the mandible was affected, 3 are believed cured after conservative enucleation, repeated several times in 1 patient; 2 are well after a second enucleation followed by an implantation of radium; 5 are

completely cured by initial complete resection; and 5 which had recurrences after conservative operation, finally came to radical resection with apparent cure. These writers restored the continuity of the mandible from three to six months after resection of the tumor in several cases by means of a bone graft from the crest of the ilium. Douglas Quick of New York (79) in a recent article recommends prolonged heavy external irradiation followed by conservative surgery and postoperative application of heavily filtered radium.

Soft odontomas These form if the mesenchymal part of the tooth germ is involved in tumor formation. They form either from the embryonic mesenchymal tissue, the dentine papilla, or the dental follicle, and later from the periodontal membrane. The result is a fibroma-type of lesion which may be spoken of as central fibroma or fibro-odontoma, the name indicating its derivation. It is recognized by the frequent presence of dental epithelium in part of the tumor. The latter is derived from the sheath of Hertwig or its remnants. On the other hand, if the epithelium is adamantinoblastomatic then the term fibro-adamantinoblastoma may be justified. In other soft odontomas the mesenchymal part may take the form of a fibrosarcoma and, if dental epithelium is present, may be spoken of as adamantinosarcoma, which has already been described.

Nagel (68) points out that soft odontomas are easily mistaken for adamantinomas, histological examination helps to make a differential diagnosis. A soft odontoma attached to a dentigerous cyst was reported by Darlington and Lefkowitz (19).

Hard odontomas These may be produced by mesenchymal tumors in which dentin or cementum has been formed, and are spoken of as *dentinoma* or *cementoma*. In other cases all calcified and uncalcified tooth tissues are represented, either in a form resembling more or less normal teeth—*compound odontoma*—or in a form which bears no resemblance to the anatomical arrangement of the dental tissue—*complex odontoma*. In addition the odontoma, which is ordinarily encapsulated by fibrous tissue resembling the dental follicle or periodontal membrane, may be contained in a cyst, in the wall of the cyst sac, or it may extend into the lumen of the cyst. This type is spoken of as *cystic odontoma*.

Cementomas have been described by Thoma (116 and 115) who points out that the cementum is a secondary formation in these tumors, and is the by-product of a soft-tissue tumor, the cementoblastoma.

strates the importance of histological examination which is brought out also by a case report by Hauenstein (38) who describes a new case of the rare combination, adamantinosarcoma. The biopsy examination led to the diagnosis of adamantinoma. The operation was delayed three months by the patient, and when the excised tissue was examined the connective tissue stroma showed the development of sarcoma.

Clinical data is available in Ivy and Curtis excellent article already mentioned (42). They describe 16 cases: 7 in males and 9 in females and 11 in white patients and 5 in Negroes. In 15 cases the tumors were located in the mandible and in 1 case in the maxilla. Five of the tumors which were treated by conservative operation recurred.

Robinson (85) also gives carefully compiled data arranged in tabular form of the 379 cases of adamantinoblastoma studied from the literature. The summary of these findings is as follows:

TABLE I—ADAMANTINOBLASTOMA

	Cases
Total number of cases	379
Sex (311 cases)	
Male	45 7/10 142
Female	34 3/10 109
Average age at time of report	37 6/10 248
Average duration of tumor	8 5/10 232
Average age at time of discovery	30 1/10 222
Site of tumor (293 cases)	
Mandible	83 7/10 247
Maxilla	16 3/10 48
Structural characteristic (219 cases)	
Cystic	57 5/10 124
Cystic and solid	24 1/10 53
Solid	19 7/10 42
Contained unerupted teeth	14
Enamel pearls, keratinization	16
Recurrence after operation	119
Metastases or histological evidence of malignancy	4 5/10

Dotz of Hamburg (21) reports a case of maxillary adamantinoma which recurred one year after operation and in seven years developed to tremendous size. It enlarged the right and left cheek, the nose and the forehead, pushed the eyes aside and caused marked swelling of the palate and epipharynx. The patient presented a monstrous appearance resembling a hippopotamus.

A very large adamantinoblastoma of the anterior part of the mandible was reported by Jaulain of Bordeaux (46) in a woman aged fifty-two. It had developed for fourteen years and after an automobile accident causing fracture of the skull and the mandible the tumor, already the size of a man's fist, tripled and reached the size of the head of a child. While the tumor was painless it interfered greatly with speech, swallowing and

mastication. After one and one-half years the patient finally consented to be operated on. The tumor including the anterior part of the mandible was excised by radical operation. In spite of good early recovery, the patient died of pneumonia on the thirteenth postoperative day.

Adamantinomas occasionally occur in other bones and in the hypophysis. A case of adamantinoma of the tibia in a woman aged thirty-six was reported by Holden and Gray of Newark, New Jersey, in 1934 (*J. Bone & Joint Surg.* 1934, 16, 401) and is to be added to a case occurring in a thirty-seven year old man reported by Bernard Fischer of Frankfurt (*Zschr. f. Path.* 1913, 12, 422), a case in a forty-six year old man was reported by Baker and Hawksley (*Brit. J. Surg.*, 1931, 18, 415), a case in a man aged thirty-six was reported by Byrne (*Brit. M. J.*, 1931, 1, 1000) and another case by Richter (*Zschr. f. Krebsforsch.*, 1930, 32, 273). All authors lay considerable stress on trauma which they believe stimulates a supposed cell rest into growth.

The treatment of adamantinoma was subjected to considerable discussion in all the articles that were published. Foremost is the question of whether it should consist of curettage or resection. Jaulain (46) states that curettage will preserve the bone and therefore will serve to maintain the support to the soft tissues of the floor of the mouth and produce less deformity. To be efficient, this treatment must remove the entire tumor and the resection should be carried into healthy tissue. The method should be confined to early, small, and localized lesions. Resection carried out in healthy tissue far away from the lesion is advised for extensive tumors and prevents recurrence. This is a grave operation, Jaulain states, and in spite of all precautions many patients succumb to resulting cellulitis or bronchial pneumonia.

Calvin of St. Paul (14) stresses the fact that most adamantinoblastomas grow slowly and disfigure the jaw more than destroy it. He reported a case with a long drawn-out history and apparently benign course. Four conservative operations were performed between 1921 and 1929 after which the patient was kept under observation for seven years. During this time there was no evidence of recurrence. Calvin advises careful x-ray study to determine whether it is possible to avoid resection of the jaw. He also advises radical operation without destruction of the continuity of the bone, for example the lower border of the mandible is to be left to maintain the form and support of the jaw. With this operation recurrences may be avoided or at least long delayed.

Dermoid cysts—teratomas Rare tumors which reproduce composite structures, or parts of the body in abnormal location, are spoken of as teratomas. Sprawson (101) reproduces an illustration of the famous "Gibbs' case" recorded by Gibbs in 1913 (32), in which on one side of the mandible of a patient a large swelling was found to contain layers of teeth—a teratoma. In ovarian and testicular tumors, or dermoid cysts, teeth and other dermal structures may be found, often contained in bone, and sometimes undergoing caries. Sprawson (101) illustrates a roentgenogram of a pelvis showing two molar teeth in an ovarian dermoid. Thueringer (120) reports a case of dermoid structures in an incipient tumor involving the dental pulp, parodontium, spongiosa of the mandible and mandibular canal, and containing hair and hair follicles in addition to the usual constituents of odontomas.

III NON-OSTEOGENIC AND NON-ODONTOGENIC TUMORS OF THE JAWS

In this group belong a number of tumors of various histological composition forming from tissue in the jaw that is neither osteogenic nor odontogenic in nature. These may be classified as follows: (1) The central giant-cell tumor which expands the bone and is coarsely trabeculated, (2) the central fibroma and fibrosarcoma which produce osteolytic defects, the first circumscribed, the latter of infiltrating character, (3) neurogenic tumors formed from nerve tissue, (4) the central angoma which is very rare, (5) Ewing's tumor which develops in the cortex and involves the bone both centrally and peripherally, (6) multiple myeloma which forms many punched-out areas in regions where red marrow remains in the adult, (7) the central mixed tumor which is definitely cystic in type, and (8) metastatic tumors.

Central type of benign giant-cell tumor This tumor, looked at by some as a lesion produced by "reactive resorption" or "resorptive new-formation," must first of all be differentiated from the osteoclastoma or giant-cell tumor occurring in generalized osteitis fibrosa of hyperparathyroid origin. A case of the latter type is reported by the Institute of Clinical Oral Pathology (41). It occurred in the mandible of a woman aged forty. A biopsy of the tumor was taken, and it was diagnosed as a benign giant-cell tumor and excised. It recurred in a different location (ramus), and the patient has suffered two pathological fractures in the long bones since the operation on the jaw. Blood chemistry was then advised which showed the blood calcium to be 11.6 mgm

per 100 c cm, the phosphorus 2.86 mgm per 100 c cm and the phosphatase considerably increased. X-ray examination showed cystic defects in several bones. This is another case added to the list of hyperparathyroid cases which were first seen by the oral surgeon for treatment of a jaw lesion.

Seldin and Darlington (95) point out that the contention of Geschickter and Copeland (28), expressed in their valuable book, *Tumors of the Bone*, is well supported by clinical observations and facts. According to their analysis, the following factors deserve attention and may lead to a better comprehension of the pathogenesis of these lesions:

- 1 Giant-cell tumors are the result of abnormal hyperplasia of osteoclasts.

- 2 In giant-cell tumors this osteoclastic proliferation takes place as a phase in the histogenesis of intracartilaginous bone.

- 3 Histologically the reaction can be divided into (a) an active progressive osteoclasia and (b) a regressive osteoclasia. In the former, hemorrhage and giant cells predominate. In the latter, cystic bone conditions and fibro-osteosis are predominant.

- 4 Regarding behavior and treatment it may be said that these tumors are benign, their rate of growth is variable, and if they are not thoroughly removed they may recur.

The pathogenesis is discussed by Gullifer (35) who points out that in the jaws these tumors, which he believes to be a reaction to inflammatory stimulus, are found in areas in which, or near which, there are cartilaginous remnants, such as the symphysis mentis, the posterior body of the mandible, and the region of the inferior turbinate in the upper jaw. Other cases of solitary benign giant-cell tumor cannot be attributed directly to precartilaginous ossification.

Symptoms, Major (58) points out, occur in sequence as follows: trauma, pain, tumor, and fracture. His case involved the maxillary sinus in a girl aged nineteen years, the tumor caused marked bulging of the bone. In a case reported by the New York Institute of Clinical Oral Pathology (70), the location of the lesion, which was monocystic, was in the canine and premolar region of the left mandible. Pulp tests were made and it was found that all the teeth involved reacted normally. Gullifer's case (35) involved the same area. It occurred in a boy aged eighteen and showed a trabeculated cyst in the roentgenogram. Seldin and Darlington's three cases were: (1) a tumor in the anterior part of the mandible from the right premolar to the left molar region, causing marked expansion of the bone and perforation of

In the growing stage the cellular tissue makes up the predominant part, this decreases in proportion as cementum is formed. When the cellular elements have exhausted their activity they remain as a thin connective tissue capsule around the calcified tumor. Thoma (115) speaks of

1. The osteolytic stage when the immature cementoma is made up of cellular tissue mistaken diagnosis is frequent in this stage as pointed out by earlier investigators (Staflne 102)

2. The cementoblastic stage in which cementoblasts have started to form cementum that can be demonstrated roentgenographically. In this stage the activity of the cellular tissue governs the size of the tumor

3. The mature inactive stage with a large calcified mass surrounded by little connective tissue

Thoma (115) and Sprawson (101) of London point out that the histological picture may present great variations because it must be remembered that although normally bone and cementum are histologically quite distinct, under abnormal conditions it is sometimes impossible to distinguish between them. In most cases the cementoblastoma produces cementicles which are fused together (Thoma 115 Fig 9) in other cases trabeculae develop and are laid down in lamellar fashion (Thoma 115 Fig 12). Occasionally the cementum is so atypical that it is hard to recognize it (Thoma 116 Fig 5)

Cementoblastomas have the tendency to occur in multiple form both the upper and lower jaws may be involved and often this condition is associated with hypercementosis of the roots of the teeth. Baumann of Freiburg (5) cites cases of symmetrical odontomas from the literature and Thoma (115) illustrates dental films of a case by courtesy of H. A. Potts of Chicago, of multiple cementomas and suggests the name *cementomolosis* for this condition. In this connection we must keep in mind that odontogenic tumors have been developed in albino rats by Burn, Orin and Smith in New Haven (12) on a mild chronic vitamin A deficiency diet (from 0.7 to 8.0 International Units)

Clinical evidence of the tumor is not common. If large the jaw may expand. Pickett of England (76) has reported a case of neuralgia caused by a cementoma attached to the apex of the distal root of the right mandibular first molar. The patient a woman aged thirty-two had suffered for four years from persistent intermittent pain which was so sudden and irregular in onset that she was unable to make plans for her activities in advance as she might be in agony any time from pain in the temporal parietal and inframaxillary regions

on the right side. Three months after extraction of the tooth and excision of the cementoma there had been no return of the neuralgia

Treatment is surgical excision is indicated if the tumor is large and expands the bone especially if it contains much soft tissue and if there are symptoms that disturb the patient. Small mature tumors should not be disturbed, especially if removal requires the extraction of sound useful teeth. Change to malignancy has not been reported in the case of cementoblastoma

Complex and compound odontomas, cystic and non-cystic, appear quite frequently in the literature during the period covered by this review. Cases were reported by Sprawson (101) Darlington and Lefkowitz (19), Worth (123) Straub (105) and Corless (18)

Complex odontomas. Worth (123) points out that this tumor can be differentiated from osteoma by the capsule which can be shown by a ray examination to surround the tumor. A complete tooth may be found underneath the odontoma which is made up of irregular masses of enamel, dentine and cementum and has no regular structure or shape (Worth (123) Fig 10). In Straub's case (105) the odontoma was made up of a retained mandibular third molar around the crown of which fitted an eburnated hard mass of bone and dentine that was transversed by canals containing blood vessels. The case reported by Corless (18) occurred in a patient aged twenty-seven who, while serving on a ship first noticed a swelling on the face which caused muscular trismus. It subsided after one week and recurred in three months with considerable pain. The roentgen picture showed a calcified tumor the mesial end of which resembled a tooth and the whole mass was surrounded by an area of bone rarefaction (infection). It was made up of a mass of enamel dentine and follicular infolding which separated the tumor from the tooth.

Compound odontomas. These are made up of a large number of separate pieces which generally resemble large and small teeth of irregular shape. The disclosure of these enables the roentgenologist to make a correct diagnosis. Excellent x-ray illustrations are given in Figures 11, 12 and 13 of the article by Worth (123). In the cystic type there is generally a large area contained in the jaw which on x-ray examination has the appearance of a follicular cyst but may be dentigerous and contain one or more fully developed displaced teeth. It differs from the follicular cyst, as Worth points out, because there are also pieces of tooth substance and denticles contained in the cyst, as shown in his Figures 14 and 15

tumefaction the size of a walnut, covered with natural skin. Intra-orally it presented a swelling the size of a pigeon's egg covered with normal mucosa, and no permanent teeth had formed in this region. Follicular cyst was suspected and seemed confirmed by roentgenograms, but since they were not typical, a slowly growing benign tumor or a cystic fibrous osteitis had to be considered. After construction of a dental splint the tumor was excised and found to consist of partly glossy transparent masses, and on microscopic examination it proved to be a neuroma. The healing was prompt and uneventful. This tumor, also called a perineural fibroma or schwannoma, is believed to be composed of a network of cytoplasmic cylinders sheathed with collagen. The ensheathing collagen endoneurium is laid down under the direction of the Schwann cells. The latter multiply by longitudinal amitotic division of the nuclei followed by cleavage of the cylinders, which causes the typical palisade arrangement of the cells. I have recently seen a similar tumor that occurred in the maxillary incisor region and was excised in the oral surgery clinic of Harvard Dental School (Fig. 6).

Central angioma. This is also a very rare tumor in the jaw, which is fortunate as extraction of a tooth or trauma may result fatally. In 1934 when the literature was reviewed only 6 cases of central angioma had been reported. A dissertation on central angioma of the jaws by Kamphues (48) describes 6 cases. This author adds a new case from the University Clinic in Muenster. There was no description of the case in the review of the thesis.

Ewing's tumor. While this tumor also was considered very rare, Geschickter and Copeland (28) report 13 cases, of which 7 occurred in children and 6 in young adults under the age of thirty. The upper and lower jaws were involved with equal frequency and, in all but 3 of the cases, the symptoms, pain, and swelling were of exceedingly short duration, less than one month on the average—a very unusual finding in tumors of the jaws. The roentgen appearance is not characteristic in these cases. The treatment consisted of radical excision with cauterization, or resection and excision combined with irradiation. These tumors in Geschickter's series diminished in size rapidly, and therefore were radiosensitive, but in no case was a cure established. This is contrary to the case recorded by me earlier (Thoma, 109), which occurred in a girl aged fourteen. The tumor was microscopically verified by Geschickter and was very radioresistant. The patient died one year after resection of the jaw. However, a case (No

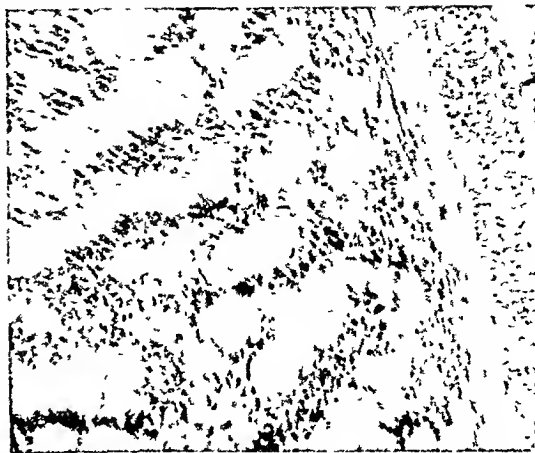


Fig. 6 Perineural fibroma from maxilla of a young woman, aged twenty

294) in a girl aged nine, followed up by the Registry of Bone Sarcoma, was cured eight years after excision of the tumor combined with postoperative irradiation with radium placed within the bone cavity.

Multiple myeloma. Four cases were recorded by me (Thoma, 110), but no case has been reported since, although the jaws must be involved frequently in this disease which occurs in so many bones almost at once. The formation in bones containing red marrow favors the involvement of the mandible at the inferior border, and in the subapical area of the molar teeth, where normal remnants of red marrow may be found.

Central mixed tumors. These tumors of salivary-gland type occur from embryonic cell enclavement in the mandible, although they are not as common as peripheral tumors on the palate or in the region of the salivary glands. Rosenthal, Leipzig (1931), Malan, Turin (1932), and Thoma (1934) reported cases. Neuhaus of Cologne-Muelheim (69) reported a tumor which was removed from the mandible. Cylindromas, related to mixed tumors, also occur in the mandible and maxilla, and will be described later (Beck, 6).

Metastatic tumors. Tumors metastatic to the jaws are comparatively rare, at least only a small number of cases have been reported. This may be due, however, to the fact that metastases occur late in malignant disease when the entire skeleton is rarely roentgenographed. Therefore, metastases in the jaw are apt to be recognized only if swelling or other symptoms occur.

Carcinoma of the lip extending to the jaw through the lymphatics is quite common. Geschickter and Copeland (30) report 6 cases

the cortex in a girl aged fifteen years, (2) a tumor causing a multicystic swelling, of the palate and labial part of the maxilla in a woman aged fifty, and (3) a tumor in a young man aged eighteen years presenting a swelling of the left side of the mandible from the symphysis to the angle with a multicystic change in the bone and expansion of the cortex.

Several case histories show evidence of mis-taken diagnosis and treatment. Differential diagnosis must be made from odontogenic cyst and fibro-osteoma. The roentgenogram Major (58) points out generally shows a lobulated cystic area with incomplete trabeculation at the periphery, but as shown by the cases of Darlington and Seldin (95), the tumor may be multilocular and the diagnosis can often be made only by biopsy. Major says also that biopsy must always be done, preferably with the high frequency current, prior to operation.

Treatment, according to all the writers mentioned, consists of curettage followed either by chemical or thermal (high frequency) cauterization of the tumor bearing area. Some surgeons advise post operative x-ray irradiations, but not irradiation without surgery. Douglas Quick (79), however states that surgery is usually contraindicated in true giant cell tumor because of the rather unusual response to external irradiation alone, although the response to external irradiation of moderate intensity in these cases is not so spectacular as with this type of tumor in the long bones of the extremities. Seldin and Darlington (95) state that the more vascular the growth the more the tendency toward malignancy and that tumors with small cells are more malignant than those with large ones. The giant cells are of the foreign body type and not tumor giant cells.

Central fibroma and fibrosarcoma. These tumors develop from non-osteogenic tissues of the bones according to Geschickter and therefore should not be classified with osteogenic tumors. The Registry of Bone Sarcoma however classifies central fibrosarcoma as osteogenic sarcoma. A tumor of this type in the mandible of a woman aged thirty-eight is reported as their Case No. 1362.

Central fibromas are generally formed from the embryonic connective tissue of the tooth germ, dental follicle or periodontal membrane and often contain dental epithelium when they are classified as fibro-odontoma or soft odontoma (see above). Other central fibromas form from the perineural sheath and are generally classified as perineural fibromas. I have 2 such cases in my collection (see neurogenic tumors). Finally central fibromas may form from retained embryonic

connective tissue cells, and in this connection the pathogenesis of the ossifying fibroma should be kept in mind (see above).

Central fibrosarcoma must be differentiated from peripheral fibrosarcoma arising from the penosteum of the bone. Kitchen and Doan (49) state that a loose tooth, or several loose teeth is the common first complaint in these cases, and therefore extraction of the tooth or teeth is often performed without recognition of the true condition. It was Bloodgood who pointed out some years ago the value of the roentgen picture as an aid in differential diagnosis in such cases. If a lesion is revealed which differs in any respect from the ordinary root abscess, one should not extract the tooth unless one is prepared to make a frozen section from material that can be scraped from the tooth. Preservation of life may depend on the first treatment when a central tumor of the jaw is exposed.

A case is reported by Kitchen and Doan (49) which occurred in a young man aged eighteen who had had the mandibular second premolar removed by a dentist a month ago. When the swelling persisted and the first molar became loose this tooth was extracted also. In both sockets an excessive growth developed which appeared as a roughened, grayish pink granulation like tissue. There was marked swelling over the region of the mental foramen and the roentgenogram showed enlargement of the mandibular canal.

Multiple sarcomatous lesion of the mandible. Biopsy showed a cellular tumor growth diagnosed as round-cell sarcoma. The patient received deep x-ray therapy but in spite of noticeable resorption and disappearance of the initial lesion there were recurrences involving the other side of the mandible the left and right maxilla, the right mastoid region and the right temporal region. All the teeth in the involved areas of the jaws became loose, and the patient died from general metastases four months after the first tooth extraction. Biopsy of metastases taken from the groin demonstrated round-cell sarcoma.

Neurogenic tumors. These tumors are formed from nerve tissue and are very rare. I have 3 cases in my collection. One is a fibrosarcoma, another an amputation neuroma occurring in the mandible after evulsion of the inferior alveolar nerve for treatment of tic douloureux which contained ganglion cells (Thoma (107) Fig. 242) and a perineural fibroma. It is very interesting therefore to find a new case in the current literature.

This case is reported by Zilkens (125) and occurred in a boy aged seventeen. He had had a swelling of the chin for eleven years which was a

round and smooth and firm to the touch. They may be sessile or pedunculated, and are well demarcated from the surrounding tissue. They generally have a thin epithelial layer and contain collagen fibers arranged in whorls. In the soft fibroma, myxomatous degeneration is often present, the mucinous area being surrounded by a more mature type of connective tissue. In other cases the tumor shows an angiomatous character which may be of capillary or cavernous type. The latter type of tumor also appears as a soft fibroma and generally grows more rapidly than the former. Fibromas occur on the gingiva, the cheeks, the palate, and the tongue. Amies also describes a congenital type, of which 14 cases have been discussed in the literature. It involves the labial plate of the premaxilla, is pink and covered by normal epithelium, and is smooth, round, and firm, consisting of connective-tissue cells which form a fine fibrillar network. Miginiac and Escat (67) describe a voluminous fibroma of the nasopharynx which had to be removed by subtotal resection of the maxilla.

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Lindemann of Duesseldorf (54) also reports a case of sarcoma which was diagnosed as epulis. The operative findings led to a general examination which revealed several metastatic tumors. This emphasizes the importance of a general examination in cases of malignancy.

Treatment must be radical. Amies recommends x-ray therapy in the very early stages, radon application through the retention of needles is not always good on account of the peculiar configuration of the growth. Pollack believes that the large number of his cures is due to radical operation and the routine use of local anesthesia. Berg could find no difference in the results in patients that received irradiation and those that did not.



Fig 7 Pregnancy tumor and gingivitis gravidarum. Patient, aged thirty-four, five months pregnant. Tumor developed in one month to present size. Microscopic examination shows angiomatous hypertrophy of the gingiva.

Hemangioma. Darlington and Lefkowitz (19) write that since exuberant granulation tissue is an unusually common finding in the mouth, the differentiation between such lesions and hemangioma by histological evidence alone is often difficult, and many angiectatic lesions represent inflammatory neoplasms.

Bancroft, Garber, and Carr (4) report a case of bilateral hemangioma of the cervicofacial area in a white female child seven weeks old. There was a swelling of both cheeks present since birth, the left larger than the right. It extended through the entire cheek and bulged the buccal mucosa. There was a large, deeply excavated ulcer on the lower lip which caused the death of the infant at the end of eight weeks. Autopsy examination showed the tumor to be a hemangioma.

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Thoma (111) recorded cases of jaw metastases with the primary lesion situated in the breast, kidney, prostate, and thyroid. A tonsillar carcinoma metastasizing to the jaw has been described by Bernard (9).

Geschickter and Copeland (30) recorded 3 cases in the Pathology Laboratory of Johns Hopkins Hospital: one an adenocystic basal-cell carcinoma originating in the mucous membrane of the nose, another a carcinoma of the prostate which invaded the lower jaw, and the third a carcinoma of the thyroid gland of a low degree of malignancy which produced a cystic area in the mandible.

Iv and Curtis of Philadelphia (44) describe a case presenting pain and swelling of the gums in the left mandibular premolar region. Several teeth had been removed previously because of pain and loosening. Biopsy showed the soft granular tissue which was curetted from the bone to be an atypical tumor. Careful examination revealed a mass high in the rectum which on biopsy showed identical tissue.

Gottlieb of New York (33) reports a metastasis of primary carcinoma in the bronchus in the anterior part of the maxilla. This became activated by extraction of a painful non-carious second molar tooth and produced a strawberry-colored growth which extended from the extraction wound. There were also metastases to the skull, ribs, clavicle, os innominatum, and larger organs.

Treatment in these cases is palliative; irradiation is often used for this purpose.

IV. TUMORS OF THE SOFT TISSUES OF THE MOUTH

These tumors may be peripheral to the jaw, formed from the periosteum, and are spoken of as peripheral tumors. If formed from the gingiva, they may be called epulis. An anatomical classification, however, is not practical, as most oral tumors may occur in a variety of locations: the palate, the floor of the mouth, the cheeks, the lips, and the tongue. Histological classification therefore seems advisable.

Inflammatory hyperplasia. Hypertrophies of the oral mucosa or the gingiva (epulis granulomatosa) are very common and must be distinguished from true neoplasms. According to Amies (3), they are caused by parodontal sepsis, intermittent fistulas, ill-fitting dentures, suction chambers on dentures, avitaminoses, leucemias, and syphilis. They may involve however the formation of fibrous tissue and then are not easily differentiated from fibroma with secondary inflammatory reaction. In some instances inflammatory cells which originally infiltrated the tissue may have disappeared. Inflammatory hypertro-

phies are described under many names, such as epulis, papillomas, and polyps. They generally are vascular, and show a tendency toward inflammatory proliferation of the epithelium which extends in the form of rete into the underlying tissue. There is marked round cell infiltration. They may be sessile, pedunculated, papillomatous, polypous, localized, or attached on long folds to the entire side of an edentulous jaw.

Pregnancy tumors present a special form and are associated with gingivitis gravidarum (Fig. 7). Peter of Wuerzburg (73) in a recent article agrees with the accepted view that their cause is growth stimulation due to hormonal activity associated with pregnancy. They are as Geschickter and Copeland (31) point out, made up of granulation tissue showing areas of angiomatous proliferation and epithelial hypertrophy. Occasionally fibromas or alveolar giant cell tumors are found which are accelerated in their growth in the first half of gestation. Two cases with a hemangiomatous histological appearance were reported by Shibata and Ohmagan (97) and Fujibayashi and Yamada (26). The first was removed six months after birth of the child, but recurred and was radically removed after eighteen months. The second patient had an epulis during each of three pregnancies. It was removed with three molars and the alveolar process on which it grew.

Peripheral giant cell tumor. This is quite a common tumor, often called epulis or giant cell epulis, because it occurs most commonly on the gingival covering of the alveolar bone. Amies of Melbourne (3) describes this tumor as of reddish brown color with a purple center; it has a round smooth surface and is firm to the touch. It may be pedunculated with a broad stalk. It is painless and, if involving the interdental space, presses the teeth apart. It generally does not involve the bone. It is more common in females than in males, with an incidence of 3 to 1, and is located more often on the outer than the inner surface of the upper and lower jaw. Experimental production of this tumor was attempted by Amies in collaboration with Wright of Melbourne. They found that the injection of various doses of parathormone into the premaxilla of normal guinea pigs during pregnancy or in artificially produced occlusal strain, would not produce an epulis.

Treatment with radon gives excellent results according to Amies, but radical surgical excision with the removal of bone and contiguous teeth is generally satisfactory. The patient must be kept under observation for at least two years.

Fibroma. Clinically soft and hard fibromas are distinguished. Amies (3) states that fibromas are

round and smooth and firm to the touch. They may be sessile or pedunculated, and are well demarcated from the surrounding tissue. They generally have a thin epithelial layer and contain collagen fibers arranged in whorls. In the soft fibroma, myxomatous degeneration is often present, the mucinous area being surrounded by a more mature type of connective tissue. In other cases the tumor shows an angiomatous character which may be of capillary or cavernous type. The latter type of tumor also appears as a soft fibroma and generally grows more rapidly than the former. Fibromas occur on the gingiva, the cheeks, the palate, and the tongue. Amies also describes a congenital type, of which 14 cases have been discussed in the literature. It involves the labial plate of the premaxilla, is pink and covered by normal epithelium, and is smooth, round, and firm, consisting of connective-tissue cells which form a fine fibrillar network. Migoniac and Escat (67) describe a voluminous fibroma of the nasopharynx which had to be removed by subtotal resection of the maxilla.

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than ordinary striated muscle. It is found in the lips, tongue, uvula, and jaws and is generally recognized only on microscopic examination. Twenty-one cases involving the tongue are known in the literature. The tumor may be congenital or acquired, slow growing or malignant—rhabdomyoblastic sarcoma.

The leiomyoma is generally an encapsulated nodular tumor of benign character which may reach enormous size. Six cases involving the mouth and the tongue, and the gingiva, and the uvula have been reported in the literature, also a fibromyoma of the tongue, and 2 adenomyomas in the base of the tongue. Peter (73) reports a case of leiomyoma in a woman aged forty. The tumor was attached to the posterior pole of the sublingual salivary gland, it was the size of a plum and extended into the mouth and prevented the wearing of a lower denture. According to the opinion of this writer, the tumor must have taken origin from an embryonic cell rest.

Melanoma. This tumor is very rare. Darling and Lefkowitz (19) report 3 cases in the upper jaw: 2 in white males aged sixty-three and sixty-four, and 1 in a negro aged thirty-two. In 2 cases there was so much pigment that the study and interpretation of the tumor cells were difficult. A very guarded prognosis is justifiable as local extension and metastases as well as death from intercurrent hemorrhage and infection are common.

Mixed tumors. Mixed tumors occur on the hard palate and the region of the salivary glands. Central mixed tumors have been discussed (see above). Hell of Hamburg (40) reports mixed tumors of the salivary gland type which occurred in unusual places, and comes to the conclusion therefore that they must be formed from displaced embryonic epithelium. It is generally supposed that both epithelial and cartilaginous cell rests must be present. Cartilaginous cell rests from the bronchial arches and clefts were found in the neck of a child aged six by Boyne of Omaha, Nebraska, (11).

McFarland (64) reviewed the cases of 300 mixed tumors of which 60 had recurred and concludes that it is impossible to relate the histopathology to the prognosis. If they grow rapidly and resemble carcinoma however the prognosis is bad. They should not be operated upon when small. They should be allowed to ripen. With the exception of mixed tumors of the palate they should be allowed to reach the size of a lemon, when the probability of recurrence is greatly lessened.

Vierseken Trip of Groningen (121) studied the history of 63 patients with tumors of the salivary

glands and divided them into several groups: (1) tumors of simple construction in which there is no chondroblastic and pseudomyxomatous change, these have a good prognosis even in case of recurrence, (2) tumors of composite construction in which such components are characteristic, these have a poorer prognosis, (3) cylindromas which have a questionable future, (4) benign mesenchymal tumors: fibromas and neuromas, (5) carcinomas which are mildly malignant, and (6) sarcomas which often terminate fatally.

Palatal mixed tumors of the salivary gland type are described by Stuch of Goettingen (104) with 2 original cases which were malignant. Rhoads and McCray (83), on the other hand state that recurrence in mixed tumor of the soft palate is extremely rare. Of 12 cases reported in the literature 3 recurred. About one half occur in the soft palate and one half in the hard palate. A case which recurred eleven years after operation is cited.

Cylindroma generally classified with mixed tumors of the salivary gland are not common according to Beck of Tuebingen (8). They occur in the parotid gland, the jaws, the scalp, the eyelids, the palate, the floor of the mouth, the tongue, the larynx and the trachea, and histologically, are made up of hyaline cylinders in which are found epithelial strands. Often they contain tube-like lumens with homogeneous, granular or concentrically arranged secretion. The connective tissue of the stroma may undergo hyaline or mucoid changes. The tumors are generally smooth, and from soft to cartilaginous in consistency, they are covered with normal mucosa. Their growth is slow; they remain small if in existence as long as thirty years. Sometimes however, they start to grow rapidly and become malignant. Two cases of malignant recurring cylindroma are cited.

Treatment by surgical excision. Rhoads and McCray state, is comparatively easy. When the tumor is completely encapsulated dissection is not difficult and hemorrhage is slight. This accounts for the low incidence of recurrence. Too few cases have been treated with irradiation to permit any estimate of its efficacy. In mixed tumors of the salivary glands, irradiation was found to cause very little regression. The writers however, advise postoperative irradiation (655 mgm. hours of irradiation by radium pack was used in their reported case) especially if complete extracapsular removal is not accomplished. Martin (6) reports treatment of 34 mixed tumors of the salivary gland type of average duration of eleven years. Eighteen of these were treated, 14 by simple excision and in 10 there was no recurrence for

from six weeks to nine years in individual cases. One patient treated by cautery excision and radon irradiation died six months later from malignant recurrence, another, after radon treatment alone, had prompt recurrence, a third is still under observation. Thirty-six patients had malignant tumors of the parotid gland with an average duration of two and seven-tenths years, 17 had surgical treatment and 6 radiotherapy, 1 had radiation after radical operation and was free from recurrence one year later. Two patients after radical surgery alone showed no recurrence for two and fifty-seven months after operation, respectively. Another patient with cautery excision is well after four years. The author concludes that radiation has not proved beneficial except as a palliative measure.

Papilloma The opinions regarding papilloma vary, the benign lesion often cannot be differentiated from the malignant according to Hedenus of Erlangen (39). It is not proved that a benign papilloma of the mouth may become malignant, although all more recent writers take the position that all papillomas should be considered potential malignancies and removed completely by excision, or treated by irradiation, which has a marked effect on these tumors. Hedenus (39) describes a case in which several biopsy examinations showed no evidence of malignancy, radical excision was performed in spite of this result, and two pieces of the tumor showed only a benign papilloma while a third piece showed squamous-cell carcinoma.

Carcinoma It is difficult to diagnose early lesions clinically, and the best time for effecting a cure is often lost by palliative treatment, including cauterization and incomplete excision. The dentist, writes Fitzgerald of Dubuque, Iowa (25), has occasion to examine the mouth and lips of his patients periodically. Therefore his responsibility in recognizing malignant lesions is obvious. Epidermoid carcinoma may appear on any part of the oral mucosa (Fig 8), including the tongue and lip, but it may also occur as a primary central lesion in the jaws from epithelial cell rests—the epithelial debris of Malassez—or the lining of odontogenic cysts. In addition, Fitzgerald points out, carcinoma may form from the mucous membrane of the antrum and invade the bone to the extent that it is difficult to say whether the tumor originated in the jaw or in the antrum. Intra-osseous carcinoma is seldom diagnosed early. The first sign is expansion of the bone and spacing and loosening of the teeth. In the mandible carcinoma is apt to involve the alveolar nerve and produce neuralgic pain, followed by paresthesia. Roentgen examination may be of decided value. Surface

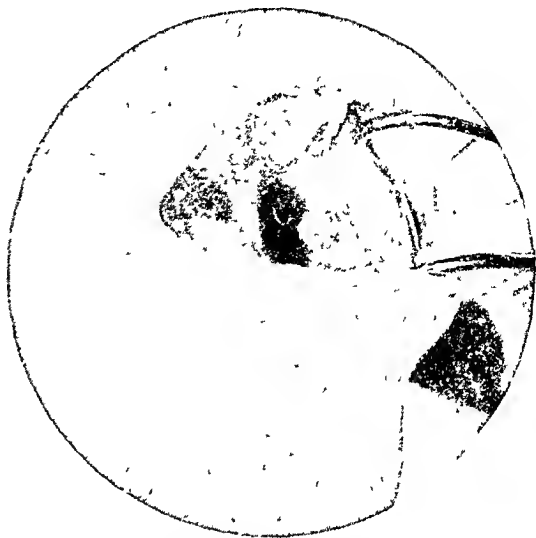


Fig 8 Epidermoid carcinoma, Grade III, on buccal mucosa of a man aged twenty-nine

lesions are generally divided into papillary, often wart-like, and ulcerating lesions.

Strout of New York (106) in a paper on tumors of the palate distinguished the following clinical forms: the ulcerating, the papillary, and the fungating type. Fitzgerald points out that in carcinoma there is a raised margin around the ulcerative area and that infiltration of the deeper structures may occur early. In some cases the surface lesion is insignificant and may be overlooked until the bone is extensively involved. Seldin (96) of New York reports such a case occurring in a man aged sixty who presented a large swelling over the right side of the face of five weeks' duration following the extraction of two loose mandibular molar teeth. There was discharge of pus and a hardened mass was visible in the region of the recent extraction. In the center of this there was a crater-like ulceration. The regional lymph glands were slightly enlarged and the patient had been treated for osteomyelitis. X-ray examination showed extensive osteolytic defects extending from the premolar region into the ramus. A diagnosis of epidermoid carcinoma was made after biopsy examination.

The importance of biopsy should be well understood, but as Fitzgerald points out, the examination should be practiced with caution. In small lesions the entire growth should be widely resected. The attention of dentists should be called to the statement that tissue attached to an extracted tooth in suspicious cases should be examined.

pathologically, and no suspicious lesions should be pronounced harmless without such examination.

The treatment of oral carcinoma and results obtained are discussed in many articles. Quick (79) pleads for the close co-operative use of operative treatment by surgery and radiation and emphasizes the fact that no matter how obviously benign a tumor of the mouth may look its removal should always be effected with utmost care and precision. For control of growth he depends on irradiation and states that there is no controversy or competition other than that regarding the factor of quality as to irradiation by means of radium or x-ray. The former is for application over localized areas, or more important for implantation in some form within the tissue, the latter is adapted to external application and is readily available in any quantity consistent with tolerance of the extratumoral normal tissue. Operative surgery is essential and of greatest value in many instances as an aid but practically never to be used for the anticipated cure *per se*, of a malignant neoplasm. Therefore it should and can be more conservative, less mutilating and less shocking and hence it is usually tolerated by patients who are poor risks. Surgery according to Quick resolves into three main uses: (1) for access to tumor-bearing areas, (2) for drainage and (3) for removal of postirradiated tissues liable to gross necrosis following irradiation for growth control.

It should be remembered, says Quick, that oral cancers occur in a wide range of histological variations and grading of the tumor is of great importance. The Grade I or fully differentiated growth is most resistant to irradiation. It may call for external therapy, implantation and possibly some surgery. A good result obtained in this type means more in anticipation of permanence than in the more anaplastic Grades III and IV as it is far less apt to metastasize locally or at a distance whereas the latter which melt away rapidly under external therapy are likely to show up in almost any part or organ as spectacularly as they disappeared locally; they disseminate through both the lymphatics and the blood stream.

Mencé of Bordeaux (66) advises the use of thermocauterization or excision followed by it to destroy the neoplasm including a wide margin of normal tissue. With this method small lesions can be completely eradicated in inoperable cases the results are, of course, no better than with other methods. The deep hole which is created facilitates the application of radium.

Meuninger of Berlin (65) reports on the advantage of very radical surgery in cases of carcinoma of the lower jaw which is used in the clinic of

Axhausen. He advises dissection of the lymphatic glands of the jugular chain and excision of an increased amount of the mucosa. The resulting defect is closed with a skin flap which includes the platysma and is pushed into the wound until it appears in the mouth. Four cases operated on are free from recurrence for two, two and one half, three, and six years respectively.

Abel of Erlangen (1) reports that in 5 advanced cases of carcinoma of the upper jaw which recurred after treatment with surgery and postoperative irradiation irradiation of the recurrent tumor by various methods proved unsuccessful.

Pollack of Duesseldorf (78) reports the results in 6 cases of cancer treated at the West German Jaw Clinic in Duesseldorf. These tumors occurred in the upper and lower jaws: the palate, tongue, maxillary sinus, lip, cheek, nose and floor of the mouth. Fifty-eight were treated surgically, one was irradiated (being small), and 3 were inoperable. Of the 58 patients who received treatment survived from two months to twelve years, 6 are alive with recurrence from one half year to seven years after operation. 3 patients died of other diseases, 3 were dismissed without benefit, 2 have not been heard of and 1 lives with metastases. Eighteen patients died, 8 soon after the operation. The writer credits radical surgery performed under conduction anesthesia for the good results and states that with the modern methods of plastic surgery there is no reason why radical surgery should not be used.

Marrow of New York (50), in an article abstracted in this journal (*Surg. Gynec. & Obst.* 1937, 65: 22) states that in the New York Postgraduate Hospital the best results in cases of carcinoma of the tongue were obtained when the tongue was removed first. The next best results followed simultaneous tongue and node operation. The poorest results were obtained when the operation upon the nodes preceded that upon the tongue. Bilateral extirpation of the nodes gave twice as good results as excision of the nodes of the affected side only. Postoperative treatment, the writer states, was not employed in a sufficient number of cases so that any conclusions as to its value could be drawn. Among the cases treated by radium irradiation and surgery the results of permanent eradication of the lesion were very poor.

Epstein (23) reports on the results of treatment of 314 cases of cancer of the tongue at the Onkologic Institute of Leningrad. Most patients were from forty-five to sixty years old, 140 were dismissed as incurable. The writer distinguishes three stages of carcinoma of the tongue:

Stage I The tumor is not larger than 2 cm and without palpable glands, 46.9 per cent of the tumors were in this group and were treated by either surgical excision with the knife or the high-frequency current, or they were destroyed by coagulation. Lately coagulation and the insertion of radium needles is favored. Of 22 patients 17, or 77.3 per cent, were well from three and one-half to eight and one-half years later.

Stage II The tumor is larger than 2 cm without visible infiltration of the surrounding tissue, but it has caused regional metastases, the glands being freely moveable. Forty-six and nine-tenths per cent were of this type. The glandular metastases occurred from the second to the sixth month after the first appearance of the lesion. Fifty-four per cent showed metastases in the first, second or third month, 84 per cent in the fourth, fifth, or sixth month, and almost all of the cases after the sixth month. This group is first treated with telecurietherapy, followed after from two to three weeks by coagulation and insertion of radium needles. Two and one-half weeks after the excision, block dissection of the glands is performed in both sides. Of 63 patients in this group, 16 or 25.3 per cent were well after from three and one-half to eight and one-half years.

Stage III The tumor is large and involves the neighboring structures, there are inoperable glands on one side or operable metastases to glands on both sides. Thirty-two and eight-tenths per cent of the tumors were treated when in Stage III. Inoperable glands were given palliative irradiation and if they became moveable were excised by Crile's method. Carcinoma in the base of the tongue was treated by the insertion of radium needles with a trocar. Twelve cases of the third type were treated with no cures.

Regato of Paris (80) reports on 72 patients with epithelioma of the maxillary sinus admitted for treatment at the Foundation Curie from 1919 to 1934, and especially on 10 patients treated with roentgen therapy alone. He concludes that the radiosensitivity of these tumors is generally great, about equal to the lympho-epithelioma. Five of the 10 patients had very extensive tumors, none of these survived. Two died two or three weeks after treatment of short duration. Two others died, one six, the other eighteen months after treatment, after recurrences complicated by necrosis of the maxilla. The fifth died eighteen months after treatment which extended over about three months and was followed by gradual recurrence. Of the 5 other patients who had lesions more or less localized in the suprastructure or infrastructure of the maxilla, 4 remained cured for from

five to fifteen years. One patient, after treatment and local healing, developed submaxillary adenopathy of rapid evolution and died six months after treatment. Complications caused by treatment in these cured cases were loss of vision, corneal ulcer and loss of the eye, and radio-necrosis of the skin requiring four years to heal.

Elling (22) reports the result of telerradium irradiation of buccal and jaw tumors at the clinic of Lund. He states in an article reviewed in this journal (*Surg, Gynec & Obst*, 1937, 65:100) that in the last ten years irradiation therapy has become the preferred method in treatment of oral carcinoma. The following difficulties are presented.

In carcinoma of the cheek an overdose may result in disintegration of the tissue. In carcinoma of the mucosa of the mandible the radio-sensitive periosteum may be affected, and large doses of treatment may lead to bone necrosis, especially in the presence of infection. Among 38 cases of carcinoma of the cheek, there were 22 five-year cures. Of 41 cases involving the mandible 9 were cured. The treatment consisted of telerradium combined with roentgen therapy, electro-endothemy, surgery, and intubation with radium needles. Many of the cases were far advanced, and in other clinics would not have been accepted for treatment.

Schoenbauer (91) gives the following

TABLE II — COMPARISON OF SURGICAL AND IRRADIATION RESULTS IN ORAL CARCINOMA

Location	Surgical treatment			Radiotherapy		
	No Cases	Radically treated	3 yr survivals	No Cases	Radically treated	3 yr cures
Tonsils	52	26	2	83	74	11
Cheek	38	28	2	30	20	5
Gums	34	21	2	18	11	0
Mouth	30	19	3	20	17	2
Tongue	172	127	22	141	120	20
Summary	326	221 67%	31 9.5%	202	242 83%	38 13%

The keynote of the article is closer co-operation between radiotherapy and surgery.

Pack (72) gives a plan for treatment of cancer with small quantities of radium. He outlines a very workable plan to determine the quantity of radium to be delivered to any tumor. The unit of doses recommended is the threshold erythema dose used at the Memorial Hospital according to Martin and Qumby's valuable tables. The following treatment is recommended for oral tumors.

Cancer of the lip Cells are imbedded on the inner side of a moulage to the extent of 0.5 cm. A dose varies from 0.75 to 1 m c hr for every square centimeter of tissue treated.

Cancer of the tongue Dorsolingual anterior cancer is treated by the insertion of parallel needles perpendicular to the surface and a dosage of approximately 130 m c hr per cubic centimeter of tissue.

Dorsolingual posterior cancer is treated the same as the anterior type if possible. Occasionally supplementary needles are inserted into the base of the tongue through the floor of the mouth anteriorly or through the submental or suprahyoid regions. Supplementary external irradiation is always given.

Infralingual cancer is treated with interstitial irradiation if infiltration has occurred. The dangers of interstitial irradiation in this location are emphasized. Superficial papillary carcinoma of the floor of the mouth and carcinoma of the superior and inferior alveolar processes are treated by the application of radium on a mold. Supplementary external irradiation is used.

Malignant tumor of the antrum or the superior maxilla Surgical resection is the sole method of treatment for an osteosarcoma or a chondrosarcoma of the antrum or the superior maxilla. Radium irradiation of the epidermoid carcinoma is preceded by surgical drainage and epuchage. An incision is made along the nasolabial fold and through the upper lip to permit correct placement of the tubes or needles. Roentgen irradiation is employed as a pre-operative and supplementary measure. In advanced cases radical excision is done.

Metastatic carcinoma in the cervical lymph nodes The great problem in the management of these nodes is the consideration of the indications and contra indications for a radical or partial cervical dissection and of when to employ radiation therapy in lieu of surgical excision. Pack believes that James J. Duffy has furnished the best answer.

INDICATIONS*

CONTRA INDICATIONS*

- 1 Metastases limited to one node or group of nodes
- 2 No perforation of capsule of lymph nodes
- 3 Primary lesion controlled or controllable
- 4 Opposite side of neck free from disease
- 5 Primary lesion limited

- 1 No apparent metastatic involvement of nodes
- 2 Perforation of capsule by carcinoma
- 3 Primary lesion uncontrolled or uncontrollable
- 4 Crossed or bilateral metastasis present
- 5 Extension of primary

ited to one side of oral cavity

6 Primary lesion composed of highly differentiated cells

7 No distant metastases

8 Patient in good general health

*All of these indications must be present for dissection

lesion to or beyond the midline

6 Primary lesion composed of highly undifferentiated cells

7 Distant metastases

8 Patient in poor general health or aged

*Any one of these contra indications precludes radical dissection

A table giving the five year cures in oral carcinoma in the Johns Hopkins Hospital at Baltimore was published by Geschickter (27)

TABLE III—FIVE YEAR CURES IN ORAL CARCINOMA

	No. of cases	Percent of cures	Percent of cures by local
Lip	395	32	83
Upper			49
Lower			
Tongue	223	15	20
Tip			11
Midborder			11
Under surface			5
Base			
Mucous membrane	213	17	25
Lower gingiva			20
Floor of mouth			10
Cheek			10
Palate			

Martin of New York (60) writes that intra oral carcinomas are generally not very sensitive to irradiation and therefore both external and interstitial exposure are indicated for their control. The external irradiation is used first and followed immediately by implantation of a small or moderate dose of radon seeds. Adequate dosage is often accompanied by certain untoward effects which can be prevented by use of the open mouth as a portal of entry for the insertion of a metal cylinder attached to the tube holder. In another article Martin (61) gives the five year end results in the treatment of cancer of the tongue, lip and cheek at the Memorial Hospital in New York. Successful results in the determinate group (after elimination of patients not followed up or dead as a result of other diseases) were as follows:

TABLE IV—SUCCESSFUL RESULTS IN CANCER OF TONGUE, LIP, AND CHEEK

Location	No.	Five year cures	Percent
Cancer of tongue	290	74	26
Cancer of lip	183	130	69
Cancer of cheek	91	28	30

Factors influencing the prognosis are important. The wide difference in clinical material makes it difficult to evaluate properly the comparative merits of contemporary treatment methods in cancer. Martin suggests a form for the reporting of net percentages of five-year end-results. The following table shows factors influencing the prognosis in 322 cases of cancer of the tongue observed at the Memorial Hospital from 1927 to 1931.

TABLE V.—FACTORS INFLUENCING THE PROGNOSIS OF CANCER OF THE TONGUE

	Total number of cases	Number of five-year cures	Per cent of five-year cures
Age in years			
Below 40	23	0	39
41 to 50	48	10	33
51 to 60	120	26	21
Over 60.	131	23	16
Sex			
Males	276	48	18
Females	46	16	35
Stage of disease			
"Operable"	90	50	55
"Borderline"	42	18	42
"Inoperable"	190	10	5
Position of growth			
Anterior third	47	13	27
Middle third	180	53	29
Posterior third	95	8	8
Metastases			
None at any time	125	51	40
Present on admission	113	6	5
Developed after admission	84	10	22
Histopathology			
Epidermoid carcinoma			
Grade I	51	23	45
Grade II	177	35	25
Grade III	23	1	4
Lympho-epithelioma	2	0	0
Transitional-cell carcinoma	14	2	14
Adenocarcinoma	5	0	0
Not Classified*	50	13	26
Associated leucoplakia	69	26	37
Associated syphilis	70	14	20

*Biopsy positive but unsatisfactory for exact classification

The use of surgical prostheses is also of interest in tumor surgery. Roy (88) of Montreal points out the advantage of a vulcanite prosthesis when an operation on the palate leaves a perforation, or for perforations caused by irradiation therapy. Such appliances must be perfectly adapted and, if teeth are present, fastened by means of clasps. The purpose is to prevent regurgitation of food and voice disturbance.

Reichenbach of Leipzig (81) describes prosthetic appliances for many purposes: (1) splints constructed to prevent fracture and to hold remaining parts of the bones in position; (2) pros-

theses either to be inserted immediately or constructed later. These also serve to prevent malposition of the remaining parts of the jaw, as well as contraction of the soft tissue. In cases of resection of half, or the posterior part, of the mandible in which no future osteoblastic operation is planned, Reichenbach advises that no attempt be made to construct an artificial joint, but instead that an intermaxillary hinge attached to dentures be used which may also serve as obturator. If the jaw is to be repaired by a bone graft later, these appliances are not satisfactory, because the pocket in which the appliance rests may subject the newly formed epithelium to irritation, and infection may thus set in. Simple splints are more useful in such cases, and with the use of a guide plane or elastics, it is still possible to hold the remaining part of the jaw in position. Obturators are described for use after resection of the maxilla to close perforations of the hard palate or obliterate defects of the soft palate. An appliance useful to prevent union between the soft palate and the posterior wall of the pharynx is pictured and described.

Preparation of the mouth and teeth before the beginning of any course of curative treatment is emphasized by Lund of Boston (55). In most cases this will entail extensive extraction of teeth, rather than cleaning and filling. It is very important, and a week or ten days may be spent for extraction and partial healing of the sockets before operation or radiation. The procedure will serve to save many serious post-treatment infections.

Sarasin of Geneva, Switzerland, (90) also stresses proper dental care in the treatment of cancer. He recommends extraction of all carious, abscessed, and pyorrhetic teeth and roots, stating that neglect of this procedure may later lead to irradiation necrosis of the jaw. He also points out that the dentist should be advised about patients who have had irradiation and warned to proceed carefully with any dental operations. The extraction of teeth even after several years may lead to stubborn infection and even complete sequestration of the jaw. The calcium salts in the bone retain radium and cause secondary irradiation of the surrounding tissue.

Protection of the surrounding organs and uninvolved tissue is of great importance in irradiation treatment. Ackerman (2) describes the construction of protective shields which limit the effects of irradiation to the area occupied by the cancer. These shields are designed to prevent irradiation of the involved maxillary bones, the lips, tongue, palate, cheeks, floor of the mouth, and salivary glands. The construction requires a knowledge of

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Cancer of the tongue Dorsolingual anterior cancer is treated by the insertion of parallel needles perpendicular to the surface and a dosage of approximately 130 m c hr per cubic centimeter of tissue.

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Malignant tumor of the antrum or the superior maxilla Surgical resection is the sole method of treatment for an osteosarcoma or a chondrosarcoma of the antrum or the superior maxilla. Radium irradiation of the epidermoid carcinoma is preceded by surgical drainage and épuchage. An incision is made along the nasolabial fold and through the upper lip to permit correct placement of the tubes or needles. Roentgen irradiation is employed as a pre-operative and supplementary measure. In advanced cases radical excision is done.

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lesion to or beyond the midline

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TABLE III—FIVE YEAR CURES IN ORAL CARCINOMA

	No. of cases	Per cent of cures	Per cent of cures by location
Lip		\$2	
Upper	305		85
Lower			49
Tongue	223	75	
Tip			20
Midborder			15
Under surface			11
Base			5
Mucous membrane	213	17	
Lower gingiva			25
Floor of mouth			20
Cheek			10
Palate			10

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TABLE II—SUCCESSFUL RESULTS IN CANCER OF TONGUE, LIP, AND CHEEK

Location	No.	Five-year No.	End result Per cent
Cancer of tongue	290	74	25
Cancer of lip	188	130	69
Cancer of cheek	91	28	30

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prosthetic dentistry A lead shield $\frac{3}{8}$ in in thickness, cut and shaped to fit over the area to be protected is vulcanized into rubber in the form of a denture that exactly fits over the teeth and is worn during the treatments. Many ingenious types of shields are illustrated in this article, with detailed description of their construction

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NECK

McEwan, P.: Clinical Problems of Thyrotoxicosis.
Brit M J, 1938, 1: 1037

Although the surgical treatment of thyrotoxicosis has been improved considerably, a steady increase in the deaths from this condition is being observed. McEwan has analyzed all deaths from this cause which occurred in England and Wales during the year of 1936.

The geographical distribution shows a remarkable parallelism to similar surveys made during the period from 1913 to 1919, and this distribution, rather than the stress of modern living, apparently accounts for the incidence of simple goiter.

The author's survey shows that an unusually high proportion of the patients were between ten and thirty years of age, and that the ratio of the mortality in men to that in women is one to eight or nine.

There were 276 deaths following operations. Chest complications and deaths following anesthesia appeared to be disproportionately high.

There were 1,420 medical deaths. Nine hundred and eight patients died of cardiac complications and 298 of these had auricular fibrillation. Vascular complications, hemorrhage, thrombosis, and embolism occurred in 91 and nephritis occurred in 21. The remaining complications were varied. Two hundred and nineteen deaths were due to uncomplicated thyrotoxicosis. Some authors believe that iodine has caused an increase in medical deaths and that it should be used pre-operatively only.

It is probable that many deaths occur because of delayed diagnoses, since thyrotoxicosis may wear various masks, such as cardiac, mental, abdominal, and general debility, and there may be an absence of detectable goiter.

Surgeons are wary of the question as to whether the death rate can be reduced by surgery.

In the author's own material, comprising 190 cases, 67 per cent of the patients were fit for work

after operation, while 33 per cent were only partially benefited or were not benefited because of associated diseases.

FRED S. MODERN, M.D.

Perkin, H. J., and Lahey, F. H.: Exophthalmic Goiter. Relation Between the Blood Iodine Level and the Duration of Symptoms in 305 Cases.
Arch Int Med, 1938, 61: 875

The blood iodine level is above normal in about 70 per cent of all cases of hyperthyroidism. In cases in which the iodine level is normal, the therapeutic response is less prompt than in cases in which the blood iodine level is high. Response is more prompt also in recent cases than in those in which symptoms are of long standing. The question of the possible correlation between the blood iodine level and the duration of symptoms arose as follows:

Three hundred and five patients (267 women and 38 men) were studied with this purpose in mind. One hundred and sixty-three cases were of nine months' duration, or less. The iodine content was elevated in 86 per cent and was normal in 14 per cent. One-half of the cases of from nine to eleven months' duration had elevated iodine values, but of the cases lasting a year or longer, 36 per cent had elevated values and 64 per cent were normal. The average basal metabolic rate was about the same in all time groups.

Hyperplastic thyroid tissue tends to be low in iodine. The longer the disease lasts, the more depleted become the iodine stores of the body. It is easy to explain how an increased thyroxin secretion can cause the symptoms of hyperthyroidism in cases of short duration, in which the blood iodine is elevated, and how such cases would respond favorably to subtotal thyroidectomy. Further explanation is necessary, however, in cases in which the blood and thyroid gland are deficient in iodine, as such cases cannot be attributed solely to the hypersecretion of an iodine-containing product of the thyroid gland.

FRED S. MODERN, M.D.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Mela B *The Pathogenesis and Treatment of the Ankyloses of the Temporomandibular Joint* (Patogenesis e terapia delle ankylosi dell'articolazione temporo mandibolare) *Minerva med.*, 1938 30 553

All disturbances of the temporomandibular joint are unusual. Ankylosis usually results from an acute arthritis, rarely from the chronic condition. Among the causes of the arthritis are trauma, gonorrhea, extension from nearby infections and metastasis from generalized acute infection. Trauma is a fairly common cause of trouble especially when the cartilages are injured or when infection and suppuration supervene. Gonorrhea in the newborn is often associated with the specific conjunctivitis and may be unnoticed because all attention is concentrated on the eyes. Gonorrhea is more uncommon as the cause of ankylosis in adults but it may produce a very acute and painful arthritis. There also are atypical cases without an acute onset in which a deforming arthritis may appear. Osteomyelitis of the ascending ramus of the mandible may develop by extension from an otitis media, suppurative parotitis or suppurative of the preauricular lymph nodes. Metastatic arthritis in the course of generalized infections occurs especially in scarlet fever and typhoid fever.

In general all these forms of acute arthritis are treated with warm packs, vaccines or intravenous antiseptic solutions. If there is pus in the joint arthrotomy may be done. Mild inflammations may leave the joint undamaged but when the articular cartilage is damaged ankylosis is almost an inevitable result.

Dufourmentel records the following incidence of the factors leading to ankylosis: trauma in 27 per cent, otitis in 11, gonorrhea in 9, scarlet fever in 8, typhoid fever in 18 and diphtheria in 4. Unknown or possibly congenital factors are present in 13 per cent of the cases.

Age incidence indicates a preponderant frequency in children.

The degree of ankylosis may be partial or complete. X-ray examination indicates whether there is an actual bony bridging of the joint with true bone. In youth the presence of ankylosis results in a growth disturbance of the mandible. In the presence of unilateral ankylosis only the corresponding half of the mandible is deformed. Bilateral ankylosis results in the characteristic Vogelbeak in which the mandible seems to be absent.

The treatment in general is based upon an operative arthroplasty often with resection of the head

of the mandible. Movement must begin soon after the operation. Various devices are described which may as yet be in the postoperative movements of the jaw.

A. Louis, M.D.

EAR

Jerlang E *Otogenous Non Purulent Encephalitis* *J Laryngol & Otol* 1938 53 233

Jerlang directs attention to uncomplicated otogenous non purulent encephalitis, and states that in 1921 Bories was the first to describe this picture as an independent clinical entity. Reliable clinical observations have been published by several authors. In cases involving the cerebrum the symptoms subsided very slowly and the patients were discharged after a period of from one to four months. According to the literature, otogenous non purulent encephalitis occurs infrequently, possibly because of the difficulty in the establishment of a diagnosis and also because the entity is frequently called pseudo-abscess.

The author reviews one of his own cases. He states that the morbid condition developing either quite suddenly or quite slowly occurs most often among children and young adults in association with both acute and chronic ear suppuration. In the absence of abscess formation the diagnosis of otogenous encephalitis is extremely difficult. In the cases in which it is assumed that the pathological processes lie in the silent areas of the brain or are limited in extent, the symptoms are so vague and atypical that the affection is either unterrogated or misinterpreted. In pronounced cases the symptoms are comparable to those presented by a cerebral abscess, abscess symptoms without abscess. As a rule the diagnosis will be made by exclusion.

In otogenous non purulent encephalitis the temperature is usually but not always high. The pulse rate is proportionate to the temperature. The cerebrospinal fluid hardly affords any diagnostic assistance since the cellular findings and the pressure are inconstant factors. Jerlang believes that the knowledge of otogenous encephalitis as an autonomous affection can be of importance in the estimation of the prognosis of apparent or suspected cerebral abscess, particularly in those cases in which the puncture of the brain fails to reveal pus. Such cases should not be considered hopeless and consequently tempt the surgeon to incise the brain without restraint under the assumption that the patient's only chance for recovery is the evacuation of pus. On the whole the prognosis of otogenous encephalitis can be considered favorable.

NOAH D. FABRICANT, M.D.

SYMPATHETIC NERVES

Allen, E. V., and Adson, A. W : The Physiological Effects of Extensive Sympathectomy for Essential Hypertension: Further Observations. *Ann Int Med*, 1938, 2 2151

Extensive sympathectomy can be carried out safely in patients suffering from essential hypertension. In 311 operations on 156 patients at the Mayo Clinic there were no operative deaths. The operation does not disable and it produces only minor effects on the sexual function, sweating, and the intestines. Only an inconsequential effect on the blood pressure was produced in 20 per cent of the 124 patients from whom information relative to their blood pressure and general health following post-operative dismissal from the hospital was secured. In 28 per cent of these, the reduction in the blood pressure was only temporary, in another 28 per cent there was significant reduction of blood pressure, which, however, did not approach normal levels; and in 24 per cent the blood pressure was greatly reduced when compared with the pre-operative reading.

Headache, nervousness, and pain in the left side of the thorax are relieved in a large percentage of instances, regardless of whether the effects of operation on the blood pressure are poor or good. Dyspnea and fatigue on exertion occur commonly after operation, but tend to disappear gradually.

No infallible method for selecting patients for operation is available. However, when the diastolic blood pressure decreases to less than 110 as a result of rest, administration of amytal, and the injection of pentothal, and when sclerosis of the retinal arteries is absent or slight, the patient will probably get a good result from operation. On the other hand, when there is advanced sclerosis of the retinal arteries, when the maximal diastolic blood pressure exceeds 150, and when the diastolic pressure does not decrease to less than 120 as a result of rest, the intravenous injection of pentothal sodium, or the administration of sodium amytal, the probabilities that the patient will receive good results from operation are slight.

Allen and Adson conclude that it is advisable to operate on more patients who have mild hypertension and on fewer patients who have severe hypertension.

Koch, C. F., and DeSavitsch, E : The Treatment of Disseminated Sclerosis by Sympathectomy and Ganglionectomy. *Brit M J*, 1938, 1 1254

The authors discuss the theoretical aspects of the cause of disseminated sclerosis. They agree with the work of others indicating that this lesion is probably produced by simple mechanical interference with the blood supply. When the pathological changes in disseminating sclerosis can be attributed to an ischemic phenomenon resulting from a spasm of the blood vessels supplying the parenchyma of the brain or spinal cord, treatment should be directed toward decreasing the alleged vascular constriction, which will permit a better blood supply to the involved area.

The authors report their experiences, based on 26 operations performed on 15 patients with advanced disseminated sclerosis, in whom the upper thoracic and lumbar sympathetic ganglion and trunks were extirpated. The pre-operative care and the technique of the operative procedures are described in detail. The approach is through a semilunar incision, made just above the clavicle and extending from the border of the trapezius muscle to approximately 1 cm beyond the midline. The vertebral artery is stripped of its sympathetic plexus over an area of from 1 to 2 cm. The stellate ganglion and the vertebral nerve are removed. There were 2 deaths following this operation. One was from embolus and the other from hemorrhage of the thyrocervical trunk. A Horner's syndrome was observed in every case. The patients avoided extreme exertion for several months after operation. There was a transient incontinence in about one-third of the cases. Ten of the 14 patients were observed for from six to fourteen months after operation. Practically every one responded favorably and the authors are convinced that this treatment in advanced sclerosis should be given further trial.

ROBERT ZOLLINGER, M. D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Dandy W E Intracranial Aneurysm of the Internal Carotid Artery *Ann Surg* 1938 107 654

Aneurysms of the circle of Willis are not uncommon. They are the cause of most subarachnoid hemorrhages. The majority of these aneurysms do not show any localizing signs. Those in which there is paralysis of the third nerve, which condition was found to be present in the author's case are exceptional. According to Sands 47 per cent of aneurysms along the posterior communicating artery produce signs which are referable to the third nerve.

The indications for operation on aneurysms at the circle of Willis which cause only subarachnoid hemorrhage are not clear. Without knowledge as to the side of the circle of Willis upon which the aneurysm is located operation is not justified. When a patient has had a subarachnoid hemorrhage and has recovered, operation is not indicated because hemorrhage may not recur for a number of years although this is not the usual course. During a subarachnoid hemorrhage and immediately after a hemorrhage has subsided one would not dare to operate as the intracranial space needed for operation would be

occupied by blood. For cases with palsy of the third nerve the indications are clear. If subarachnoid hemorrhages recur and the prognosis seems hopeless, operation is perhaps indicated if there is a suggestion as to the side upon which the aneurysm is located. Arteriography may be of considerable aid in such cases.

Dandy reports a case of aneurysm of the circle of Willis which he believes to be the first one in which an attempt at cure was made by a direct attack on the aneurysm. It was that of a forty three year old male alcoholic patient who in the course of about forty eight hours lost the function of his right third nerve. At operation an aneurysm with a narrow neck springing from the internal carotid artery was found (Fig 1). An ordinary flat silver clip was placed over the neck of the sac and tightly compressed which obliterated it completely. The sac distal to the silver clip was then thrombosed with the electrocautery. DAVID J IMPASTATO M D

Matas R Aneurysms of the Circle of Willis *Ann Surg* 1938 107 660

There are 3 classes of arterial aneurysms in the brain:

1. The military aneurysms of the central arteries. These are the most frequent and most fatal and are beyond surgical reach except when they create circumscribed hematomas in the substance of the brain.

2. The larger aneurysms of the carotid trunks up to the circle of Willis. This type may be treated by extracranial ligation of the internal and common carotid trunks in the neck.

3. An intermediary group arising from the circle and its surface branches. These are not controllable by extracranial ligation of the parent trunks in the neck but can be treated by a direct intracranial attack. Operation in these cases should be preceded by accurate localization of the aneurysm by the usual methods supplemented by cerebral angiography, which is the only procedure which will show definitely that the pathological lesion is an aneurysm and nothing else.

The effect that the removal of an aneurysm may have on the area supplied by the obliterated vessel through ischemic suppression of its blood supply should be seriously considered. It is well to remember that it is practically impossible to obliterate the vast majority of these aneurysms without interruption of the circulation in the circle and serious impairment of the nutrition of the area of the brain that is supplied by the arteries given off from the circle beyond the obliterated branch. It is also possible that in extirpation of an aneurysm in the circle the obliteration may be indefinitely extended along the circle by progressive intravascular thrombosis.

DAVID J IMPASTATO M D

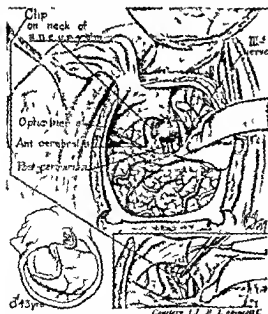


Fig 1. Drawing of aneurysm. Inset on the left shows the operative approach with the aneurysm concealed in position. Inset on the right shows clip placed on the neck of the aneurysm and the cautery thrombosing the sac.

Such a lesion could be one of only two conditions (1) extramammary Paget's disease or (2) intra-epidermal melanoma without pigment formation. The chief factor which enables the author to differentiate between the two was the primary site. Every unquestioned case of extramammary Paget's disease has occurred in the male or female genital regions, or in the axilla where there are apocrine glands. The morphology of the metastases further pointed to the diagnosis of melanoma rather than Paget's disease.

J. DANIEL WILLEMS, M.D.

TRACHEA, LUNGS, AND PLEURA

Culp, O. S.: Primary Carcinoma of the Trachea
J Thoracic Surg, 1938, 7 471

Only 433 primary tumors of the trachea have been reported up to 1937, and 147, or 34 per cent, were carcinomas. The carcinomas occurred most frequently near the bifurcation of the trachea, more frequently in the upper third and least frequently in the middle third. The tumor was usually located in the posterior wall of the trachea and in only 5 cases was there an annular lesion.

There is no correlation between the incidence of metastases and the age periods. The squamous-cell variety had most often metastasized. The metastases were usually regional, involving the esophagus, and the mediastinal, peribronchial, and cervical glands.

The age of the patients varied from eighteen years to eighty-two years, and there was a fairly equal distribution of the condition between thirty and seventy years of age. Sixty-three per cent of the patients were males.

In general, the carcinomas fall into two main groups, (1) those arising from glandular epithelium and (2) those arising from surface epithelium. The predominant cell in the latter group may be columnar, cylindrical, basal, or squamous. Of these the squamous-cell carcinoma is the most common.

The author adds 2 new cases of primary carcinoma of the trachea to the literature. One patient was a sixty-eight-year-old man who died of a metaplastic squamous-cell carcinoma of the trachea with direct invasion of the mediastinum, regional lymph nodes, and metastases to the esophagus. The second patient was a fifty-four-year-old woman who had a metaplastic transitional-cell carcinoma of the trachea with direct invasion of the mediastinum and the thyroid gland.

From the cases previously reported and the 2 cases presented it is found that most patients die within one year, but a few isolated patients lived as long as one year. The type of therapy had little, if any, effect on the outcome. EARL O. LATIMER, M.D.

Holst, J.: The Symptoms and Treatment of Bronchiectasis (Klinik und Therapie der Bronchiektasiekrankheit) *Finska lak-sällsk handl.*, 1937, 80 794

The use of bronchography and bronchoscopy in the diagnosis of pulmonary conditions has resulted

in earlier recognition of bronchiectasis and more radical treatment of that condition. The author discusses only the so-called primary bronchiectasis. A number of these cases are undoubtedly congenital, others occur in youth following influenzal pneumonia or diphtheria. Of more importance to the surgeon is the site of the disease. Clinical symptoms usually follow only after infection. The usual clinical picture in bronchiectasis is the result of a vicious circle, the combined action of retention and infection, and this condition can be interrupted only by attack of the retention.

Most of the patients with bronchiectasis died of a pulmonary complication, according to Blake 34 per cent died of bronchopneumonia and 16 per cent of metastatic brain abscess. The author reports 19 cases of primary bronchiectasis, in which 9 of the patients were under ten years of age and 7 were over twenty years of age. Among the important symptoms mentioned, drumstick fingers were present in 8 patients. The clinical diagnosis is made by means of x-rays and bronchography. In the differential diagnosis tuberculosis is most important, 9 of the 19 patients whose cases were reported had been inmates of tuberculosis sanatoria up to six years. Pulmonary abscess is also confused with bronchiectasis occasionally. Other conditions may be excluded by bronchoscopy.

From the literature it is clear that the radical treatment must be lobectomy. Collapse therapy, consisting of pneumothorax, phrenicotomy, and thoracoplastic operations, offered nothing. Lobectomy was performed 10 times. One patient on whom a bilateral lobectomy was performed died of empyema. The 8 other patients on whom lobectomy was performed recovered. One of these is still under treatment, the 7 others are well. The operative technique employed was that of Brunn, an American surgeon. The attempt to dry up the bronchi by means of the bronchoscope and suction was not encouraging. Deep anesthesia with a mixture of ether, oxygen, and carbon dioxide was used, it was preceded by large doses of morphine and scopolamine. An absolute contra-indication to the operation is the absence of two normal lobes of the lungs.

(GERLACH) LEO A. JUHNKE, M.D.

Sauerbruch, F.: The Status and a Critical Study of the Operative Treatment of Bronchiectases and Pulmonary Tuberculosis (Stand und Kritik der operativen Behandlung der Bronchiektasen und Lungentuberkulose) *62 Tag d. deutsch. Ges. f. Chir.*, Berlin, 1938.

The author's report is based on statistics from more than 500 clinics, hospitals, and sanatoria in Germany and elsewhere. Among the surgically important forms of bronchiectasis, the traumatic, the contraction bronchiectasis, and finally, the congenital dilatation resulting from malformations of the bronchial branches are discussed in detail.

The unilateral lobectomy of the Munich Clinic had to be abandoned because of retraction of the

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Romano S A and McPetridge E M The Limits and Dangers of Mammography with Contrast Mediums *J Am M* 121 1938 110 1905

Reports in the literature of the value of mammography and of the harmlessness of stabilized colloidal thorium dioxide under these circumstances led the authors to undertake its use in a personal investigation. The material included 25 patients 23 of whom were operated upon later. In 13 of these 23 patients the mammographic diagnosis agreed with the clinical diagnosis and was later confirmed in the laboratory. In the other cases the diagnosis was either not definite or was actually incorrect. The most serious errors occurred in cases of malignant disease. These errors were found to be evident clinically but were not revealed by mammography.

In 4 of the 25 patients the injection of iodized oil or of colloidal thorium dioxide gave rise to foreign body reaction and the condition of 3 patients became very severe. In 2 of these amputation of the breast would have been necessary because of the reaction even if it had not already been planned for the original condition.

An experimental study on animals resulted in foreign body reactions in more than 50 per cent of the cases, all reactions being similar to those noted in the clinical cases. The various agents used experimentally, all of which were satisfactory from the radiological standpoint, were sometimes followed by reactions. Lavage of the breast after injection did not prevent the reaction in all cases, nor did physiological lavage, brought about by the act of nursing, prevent it.

These authors do not feel that the method as it is now employed contributes diagnostic aid of sufficient value to warrant the risks of the serious reaction that may follow it. Until an agent is discovered which is non-irritating to the breast tissues and which is at the same time satisfactory from the radiological aspect, they do not advise the use of mammography by means of contrast mediums.

J DANIEL WILLEMS MD

Frantz V K The Prognostic Significance of Intracellular Mucicarmophilic Material in Carcinoma of the Female Breast *Am J Cancer* 1938 33 167

This is a report of 130 cases of carcinoma of the breast in all of which a radical mastectomy was done during the period from 1926 to 1934. The author reports upon the presence or absence of metastases in the axilla, the grade of the tumor according to the plan of Haagensen, and the presence or absence of mucicarmophilic material in the stained sections.

The follow up study was conducted upon 91 per cent of the cases for a period of from five to nine years. It was found that the mucicarmophilic material appears in all grades of the tumor, but the relative amounts found had no significance. It appeared that the presence or absence of this material in the cells of carcinoma of the breast was related to the length of life after operation, the presence of intracellular mucicarmophilic material was a favorable sign and of aid in the prognosis of the Grade II tumors.

The author points out that no histological characteristic has yet been found which carries the weight of the well known clinical findings, such as age of the patient, extent of the local tumor and the presence of axillary metastases.

J DANIEL WILLEMS MD

Stout A P The Relationship of Malignant Amelanotic Melanoma (Nevocarcinoma) to Extramammary Paget's Disease *Am J Cancer* 1938 33 196

The author reports a case of a tumor of twelve years duration occurring in a woman seventy-one years old. He believed the tumor to be a pigment free malignant melanoma, the primary manifestations of which were indistinguishable from Paget's disease. This tumor appeared in the left popliteal region and consisted of a crusting lesion which occasionally bled. Eight years after its appearance it was treated by irradiation and disappeared except for one small crusting area. Four years later two small lesions were present in the original site and in addition a firm nodule in the left femoral region was found. These were all excised, the denuded area covered with skin grafts and irradiation was administered. After nineteen months death came from pulmonary metastases.

The histopathological study of the popliteal lesions showed the epidermal layer to be intact, the rete pegs thickened and elongated to three times their normal size. The tumor cells were rounded or elongated with hyperchromatic nuclei, clearly defined nuclear markings, and only one nucleolus. Mitoses averaged one in every five high power fields. The cytoplasm was granular and neutrophilic and the cell membrane distinct. The Fontana stain showed no trace of melanin. Similar study of the femoral lymph node showed practically complete replacement of the lymphoid tissue by tumor cells. These were arranged in thick cords separated by slender collagen bands near the capsule, and by thick fibrous strands near the center. The cells were large, rounded and with large hyperchromatic nuclei placed centrally. Mitoses averaged one in each high power field. No trace of pigmentation was apparent either grossly or with the Fontana stain.

of a high laparotomy running parallel with the left costal border. This operation may be extended to a laparothoracotomy by a splitting of the cartilaginous costal arch and the diaphragm when ligation of the vena azygos seems to be necessary and urgent.

The toilet and clarification of the surgical pathology of the epigastric region (liver, spleen, stomach, and cardia) must demonstrate the necessity and utility of additional operative aids, such as splenectomy for the splenopathic genesis of the varix, the application of a liver fontanel or superficial hepato-stomy, gastrostomy for shunting out the esophagus, hepatopexy plus omentopexy, the elimination of all cases of perportal causes of compression, and detoxicating cecostomy for elimination of the toxically acting blood within the interior of the gut.

As esophageal hemorrhage, especially in young individuals, may be the first and only indicator of cirrhosis of the liver, the timely demonstration of the varicose origin of the hemorrhage becomes necessary for diagnostic purposes and it will be of surgical aid (C HENSCHEN) LOUIS NEUWELT, M D

Marshall, S. F.: Carcinoma of the Esophagus: Successful Resection of Lower End of Esophagus with Reestablishment of Esophageal Gastric Continuity. *Surg Clin North Am*, 1938, 18 643

Carcinoma of the esophagus is characterized chiefly by its inoperability and by its high mortality. Generally the level at which most carcinomas occur is influenced apparently by points of narrowing in the esophagus. These points of narrowing are at the cricoid, at the aorta and left bronchus, and at the diaphragmatic opening. The symptoms usually consist of difficulty in swallowing, regurgitation of food, which may be blood stained, or the presence of substernal pain.

Ewing has pointed out that early and extensive metastases are likely to occur because of the abundant blood and lymphatic supply and because of esophageal movements resulting from swallowing. Early diagnosis is essential if operation is to be successful, and any history of dysphagia warrants careful fluoroscopic examination and esophagoscopy, a biopsy of the tumor can be performed to obtain a specimen for microscopic confirmation, and is essential for establishing the diagnosis.

The surgical removal of carcinoma of the lower third of the esophagus is influenced by the inaccessibility of the lesion and, too frequently, by the extension to the surrounding structures due to late diagnosis. In the majority of cases the advanced nature of the disease will permit the employment of only palliative measures, such as dilatation of the malignant stricture, intubation of the esophagus, or gastrostomy. In the event esophagectomy is not possible, gastrostomy should not be postponed until swallowing is impossible and until a grave state of malnutrition has developed. The mortality in late palliative operations may be very high.

A man, aged forty-six years, came to the Lahey Clinic in Boston because of pain in the epigastrium

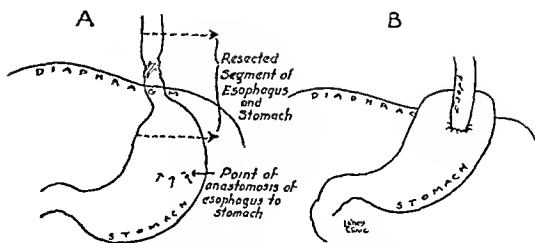


Fig 1 A, Illustrating portion of stomach and esophagus containing tumor to be resected. B, The divided end of stomach has been inverted. The esophageal stump is transplanted into the anterior wall of the stomach, forming a new opening of the esophagus into the stomach. The incision in the diaphragm is closed about the stomach, which is partly intrathoracic.

which extended through to the back when he swallowed solid foods. The symptoms were of nine months' duration. Roentgenological examination had revealed an obstruction at the lower end of the esophagus and microscopic examination of a specimen obtained from the tumor through an esophagoscope showed it to be an adenocarcinoma.

A successful resection of the lower portion of the esophagus and the upper third of the stomach was carried out, with anastomosis of the remaining part of the esophagus to the anterior wall of the stomach after the stomach had been pulled partly into the thoracic cavity to take the place of the resected esophagus. With the patient in the left lateral position, a long infrascapular incision was made on the left side parallel to the ninth rib, the trapezius was divided, the scapula elevated, and the ribs were exposed. The entire length of the exposed ninth rib was excised, sections were removed near the proximal ends of the eighth and tenth ribs and the pleura was opened. The lung was retracted and the inferior pulmonary ligament divided. The left phrenic nerve was identified and injected with novocain in order to abolish the movement of the left half of the diaphragm. The pleura over the esophagus was incised and the esophagus exposed. The diaphragm was then opened by a radial incision extending from the esophageal hiatus to the costal margin, the peritoneal cavity being entered in this manner. The stomach was brought up partly into the thorax and mobilized by dividing the left gastric artery and other vascular attachments along the lesser curvature. The greater curvature was also mobilized by division of its vascular attachments, both curvatures being carefully cleaned off. The mobilization of the esophagus was then completed and the tumor was readily palpated at the lower end of the esophagus. The point of division of the stomach was selected and two Payr clamps were applied about 7.5 cm distal to the lesion and including about one-sixth of the upper part of the stomach (Fig 1). Double clamps (Ochsner) were then applied to the esophagus about 3 or 4 cm above the lesion, a division was made between both pairs of clamps,

bronchus stump into the mediastinum. As a result a procedure of two or more stages was developed as described by Sauerbruch at the 1934 German Surgical Congress. Brunn has revived the one stage lobectomy but he uses a different technique. An important advance is drainage of the chest cavity. One stage lobectomy is indicated chiefly in younger individuals with localized findings. The two stage procedure is safer and easier on the patient. An in-between method is that of Nissen. Packing and drainage are included in the armamentarium of surgical therapeutic methods.

The surgical treatment of pulmonary tuberculosis must depend on the character and development of the disease. The important factor consists of choosing the proper time. Some of the newer recommendations ignore the old principles. Historical consideration reveals that the conceptions of Quincke, Spengler and Forlanini-Murphy form the entire basis for the modern treatment of pulmonary tuberculosis. All of them seek the same goal: relaxation, narrowing and compression of the lung. In the first phase of surgical treatment the ground work was laid: paravertebral resection from the first to the tenth or eleventh rib, apicectomy, anterior plastic partial plastics over the upper lobe, phrenicotomy and packing. Further development urged early operation often for external reasons. Their conditional justification is critically discussed in relation to the character of the disease. The proponents of general early operation overlook the frequency of spontaneous healing of cavities.

Extrapleural pneumothorax and oleothorax can not yet be generally recommended because of their dangers. Their evolution, however, is desirable as is also the substitution of a better medium for paraffin in plombage. The method has proved of value in the hands of many surgeons when used with proper indications and technique. Good results are obtained in combination with other methods in bilateral tuberculosis. A further advance consists in the abandonment of routine phrenicotomy. The present use of thoracoplastic procedures is gratifying. It is agreed that so-called apical plastic surgery should be considered in only very circumscribed lesions. More extensive partial plastic surgery is merely a gradation of the old paravertebral rib resection. This has retained its old limit of indications. With circumscribed findings (apical and upper lobe cavities) the resection of 7 or 8 ribs with dropping of the shoulder blade is generally recommended. Recently the swing has been away from this in favor of mobilization of the upper anterior chest wall (the old anterior plastic).

In his concluding remarks the author mentions certain dangers, the alienation of the practicing surgeon, increasing exclusion of the University Clinics and Hospitals from active co-operation on the question of the surgical treatment of pulmonary tuberculosis. The final solution of these problems remains with the personality of the physician.

(SAUERBRUCH) LEO M. ZIMMERMAN, M.D.

ESOPHAGUS AND MEDIASTINUM

Henschen, C. The Operative Treatment of Rupture of the Varices of the Esophagus by Subdiaphragmatic Occlusion of the Veins (Die operative Behandlung der Varizenruptur der Speiseröhre durch subdiaphragmatische Venen-sperre). *6 Tag d. deutsch. Ges. f. Chir. Berlin 1933*.

Massive hemorrhages from ruptured varices of the esophagus almost always run a fatal course. Internal methods of hemostasis, hemostatic transfusion, tamponade of the esophagus and ligation of the large arterial stems in the neck are useless. Efforts at surgical aid are therefore directed toward the idea of stopping the source of hemorrhage at the site of the bleeding itself, i.e., toward carrying out local hemostasis.

Hemorrhages from the venous areas of the esophagus arise from different anatomicoconditional regions: (1) (rarely) from an 'angioma venosum' of the esophagus; (2) (rarely) from congenital phlebotaxis or vascular anomalies; (3) (rarely) from venoparalytic neurovarices, i.e., dilatations of veins as a result of diseases of associated regions of the nervous system; (4) from phlebotic diseases of the esophageal veins, for example phlebitis following chronic appendicitis with death from hemorrhage and typhoid phlebitis; (5) from traumatic lesions of the esophageal veins; and (6) (most often) from static varices (compensatory venectasias) in association with previous diseases in the region of the liver (cirrhosis, syphilis) or the portal vein (thrombotic or thrombophlebotic obliteration of the vein with portal vein compensation by aneurysm of the hepatic artery or tumor). These compensatory dilatations of the veins, sometimes of the thickness of a lead pencil and known in the stricter sense as varices of the esophagus, are situated in the region of one of the accessory vents of the portal vein. They are the inferior esophageal veins draining the region of the portal vein via the vena coronaria ventriculi to the azygos vein in the lower fifth of the esophagus or around the cardia.

The diagnosis of these particular causes of hemorrhage is based upon the clinical general findings (diseases of the liver, appendix, spleen, portal vein) upon the typical roentgen findings to be practiced eye to be observed by a special technique (deformity of the cardia and of the gastric form, circumscribed filling defects on the posterior wall of the esophagus, circular lighter areas, a niche at the site of the rupture, a peculiar finding of the esophageal relief (string-of-pearls symptom) and delayed passage of the test meal) and finally upon the direct esophagoscopy evidence of the varices and in every case of the site of bleeding or rupture.

With the aid of an operative observation it is shown that it is possible to master this so fatal hemorrhage surgically by means of a systematically planned intra-abdominal ligature occlusion of all the venous trunks (vena coronaria ventriculi) leading from the infracardial zone of the esophagus by way

SURGERY OF THE ABDOMEN

GASTRO-INTESTINAL TRACT

Persson, M.: Postoperative Phlegmonous Gastritis (Gastritis phlegmonosa postoperativa) *Acta chirurg Scand*, 1938, 80 497

Resection of the stomach and duodenum plus gastro-enterostomy, Billroth II, were undertaken on a female patient, forty years of age, with medically intractable ulcer of the duodenal bulb. Healing was uneventful and the patient was discharged two and a half weeks later. The next day, after returning home, fever, sore throat, and prostration of influenzal character developed, and two days later vomiting occurred and pain was present in the right lower quadrant. The appendix at removal, twenty-two days after the resection, exhibited some pathological changes and there was some seromucous fluid in the peritoneal cavity, but palpation of the upper abdominal cavity through the operative incision failed to reveal any evidence of abscess.

Following appendectomy the condition of the patient became worse and two days later, under a tentative x-ray diagnosis of subphrenic abscess, the eleventh and twelfth ribs on the left side were resected, and a large abscess, bounded by the stomach, spleen, left lobe of the liver, and diaphragm, was uncovered and drained. The stomach at this operation was swollen and thickened, and at autopsy the following day the gastric wall was found to be greatly thickened and inter-pocketed with turbid grayish-yellow pus. Culture revealed the streptococcus. The course of the condition was as follows: phlegmonous gastritis, subphrenic abscess, and then diffuse purulent peritonitis.

This case, in view of 2 others reviewed by the author from the literature, 6 collected by Finsterer and 4 by Perman (*Acta chirurg Scand*, 1935, Supp 38, in English), is the thirteenth reported instance of postoperative phlegmonous gastritis. The author accepts in the main the conclusions of Perman, even believing that the peculiarities of this case strikingly support that author's views as to the pathogenesis of the condition.

The long, complication-free interval following the resection renders the subsequent development of a nascent phlegmonous process unlikely, but the toxins of the anal process would explain the presence of a hypo-acidity favoring prevalence in the stomach of virulent swallowed bacteria, which might invade the gastric wall by way of the sluggishly healing mucosal stratum of the suture line at the gastro-intestinal junction, resulting from the first operation.

As practical conclusions the author suggests the importance of pre-operative mouth hygiene and of the shielding, in so far as possible, of the patient recently operated for ulcer from infections of the respiratory tract.

JOHN W BRENNAN, M.D.

Didier, R., and Bompert, H.: The Treatment of Ulcer Situated High on the Lesser Curvature by Gastrectomy in Two Stages (Le traitement de l'ulcère haut situé de la petite courbure par la gastrectomie en deux temps) *J. internat de chir*, 1938, 3 451

The authors devised a two-stage operation for ulcer situated high on the lesser curvature in order to avoid the leakage at the suture line which frequently occurs following resection of the stomach in patients having a peptic ulcer of the cardia. In the first stage a gastro-enterostomy is performed without invasion of the inflamed ulcer area, and in the second stage, which is done after the gastro-enterostomy has healed, essentially a gastric resection is done.

The authors believe that this two-stage operation lowers the mortality by reducing the tendency toward leakage of the gastrojejunal suture line. The operative technique consists of first freeing the greater curvature of the stomach and placing a clamp as shown in Figure 1. Then a retrocolic gastrojejunostomy is made as shown in Figures 2, 3, and 4. This gastrojejunostomy is really an end-to-side anastomosis. A triangular stomach segment, the base of which is the greater curvature, is resected at this time, and the lesser curvature containing the ulcer is left undisturbed. From four to six weeks later the rest of the stomach is resected, at which time the original lesion is much smaller.

The authors also believe that this operative technique is simpler. In a series of 20 cases they

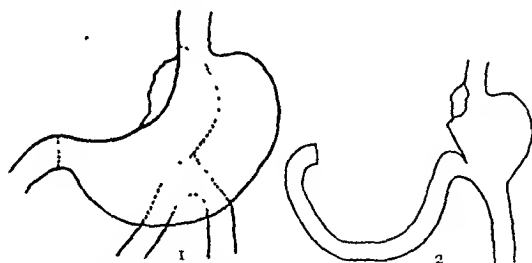


Fig 1 Grooved gastrectomy of Pauchet
Fig 2 Procedure of Wells

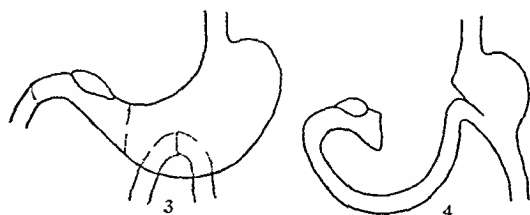


Fig 3 Ancient pyloroplasty
Fig 4 Resection by exclusion according to Finsterer

and the tumor was removed. The open end of the stomach was closed by over and-over catgut stitches and inversion obtained by a second row of catgut stitches reinforced with interrupted silk stitches. The stump of the esophagus was then transplanted into the anterior wall of the stomach through an incision placed several centimeters below the point of division of the stomach. The anastomosis was completed by an inner mucosal layer of interlocking catgut reinforced by serosal stitches of interrupted silk. This anastomosis appeared to be entirely satisfactory and the stoma would easily admit one finger. The edges of the incision in the diaphragm were approximated to the stomach inferior to the anastomosis. The stomach was placed partially in the intrathoracic region and the incision in the diaphragm was closed so there would be no possibility of the herniation of abdominal contents into the pleural cavity. This suture row was reinforced by interrupted stitches of silk. A catheter was placed in the thorax through a stab wound sutured to the posterior parietal pleura and attached to a constant suction apparatus for drainage. The thoracic wound was then closed.

Microscopic study of the tumor revealed that the lesion was an adenocarcinoma with metastasis to two of five lymph nodes. Blood transfusions were administered during and following the operation. Convalescence was stormy for the first twenty-one days after the operation and the patient required repeated bronchoscopic examinations in order to remove the mucous accumulation in the air passages. Eleven days after operation spontaneous rupture of the wound occurred and secondary closure was necessary and was safely accomplished.

The patient was dismissed from the hospital on the fortieth day the wound was healed and he was feeling comfortable. He was able to swallow satisfactorily and was taking five feedings daily.

Following dismissal from the hospital, he was seen at intervals. He had some difficulty with a choking sensation which was present at all times and not aggravated by swallowing. Esophagoscopy was performed because of persistent esophageal obstruction. The upper part of the esophagus was found to be dilated and inflamed. The esophageal opening into the stomach was about 1 cm in width and did not dilate readily. After dilatation the patient experienced relief and was able to swallow satisfactorily. He was last seen in the clinic seven months after the operation at which time he was able to swallow quite well but complained of some pain in his chest. JOSEPH K. KARL, M.D.

MISCELLANEOUS

Lanzillo F. Surgery of the Diaphragm. I. Surgical Anatomy (*Chirurgia del diaframma. I. Anatomia chirurgica*). *Rivista interna di clin e terap* 1937 29 512

The author presents a detailed review of the anatomy and surgical relationships of the diaphragm. He no longer believes that this structure simply divides the abdomen from the chest. He rather believes it to be one of the important structures in what might be called the thoraco-abdominal portion of the body as represented by the portion between two hypothetical horizontal lines, one marking the lower level of the diaphragm, the other, the upper level. A. LOUIS ROE, M.D.

SURGERY OF THE ABDOMEN

GASTRO-INTESTINAL TRACT

Persson, M : Postoperative Phlegmonous Gastritis (Gastritis phlegmonosa postoperativa) *Acta chirurg Scand*, 1938, 80 497

Resection of the stomach and duodenum plus gastro-enterostomy, Billroth II, were undertaken on a female patient, forty years of age, with medically intractable ulcer of the duodenal bulb. Healing was uneventful and the patient was discharged two and a half weeks later. The next day, after returning home, fever, sore throat, and prostration of influenzal character developed, and two days later vomiting occurred and pain was present in the right lower quadrant. The appendix at removal, twenty-two days after the resection, exhibited some pathological changes and there was some seromucous fluid in the peritoneal cavity, but palpation of the upper abdominal cavity through the operative incision failed to reveal any evidence of abscess.

Following appendectomy the condition of the patient became worse and two days later, under a tentative x-ray diagnosis of subphrenic abscess, the eleventh and twelfth ribs on the left side were resected, and a large abscess, bounded by the stomach, spleen, left lobe of the liver, and diaphragm, was uncovered and drained. The stomach at this operation was swollen and thickened, and at autopsy the following day the gastric wall was found to be greatly thickened and inter-pocketed with turbid grayish-yellow pus. Culture revealed the streptococcus. The course of the condition was as follows: phlegmonous gastritis, subphrenic abscess, and then diffuse purulent peritonitis.

This case, in view of 2 others reviewed by the author from the literature, 6 collected by Finsterer and 4 by Perman (*Acta chirurg Scand*, 1935, Supp. 38, in English), is the thirteenth reported instance of postoperative phlegmonous gastritis. The author accepts in the main the conclusions of Perman, even believing that the peculiarities of this case strikingly support that author's views as to the pathogenesis of the condition.

The long, complication-free interval following the resection renders the subsequent development of a nascent phlegmonous process unlikely, but the toxins of the anal process would explain the presence of a hypo-acidity favoring prevalence in the stomach of virulent swallowed bacteria, which might invade the gastric wall by way of the sluggishly healing mucosal stratum of the suture line at the gastro-intestinal junction, resulting from the first operation.

As practical conclusions the author suggests the importance of pre-operative mouth hygiene and of the shielding, in so far as possible, of the patient recently operated for ulcer from infections of the respiratory tract.

JOHN W BRENNAN, M D

Didier, R., and Bompard, H. The Treatment of Ulcer Situated High on the Lesser Curvature by Gastrectomy in Two Stages (Le traitement de l'ulcère haut situé de la petite courbure par la gastrectomie en deux temps) *J. internat. de chir.*, 1938, 3 451

The authors devised a two-stage operation for ulcer situated high on the lesser curvature in order to avoid the leakage at the suture line which frequently occurs following resection of the stomach in patients having a peptic ulcer of the cardia. In the first stage a gastro-enterostomy is performed without invasion of the inflamed ulcer area, and in the second stage, which is done after the gastro-enterostomy has healed, essentially a gastric resection is done.

The authors believe that this two-stage operation lowers the mortality by reducing the tendency toward leakage of the gastrojejunal suture line. The operative technique consists of first freeing the greater curvature of the stomach and placing a clamp as shown in Figure 1. Then a retrocolic gastrojejunostomy is made as shown in Figures 2, 3, and 4. This gastrojejunostomy is really an end-to-side anastomosis. A triangular stomach segment, the base of which is the greater curvature, is resected at this time, and the lesser curvature containing the ulcer is left undisturbed. From four to six weeks later the rest of the stomach is resected, at which time the original lesion is much smaller.

The authors also believe that this operative technique is simpler. In a series of 20 cases they

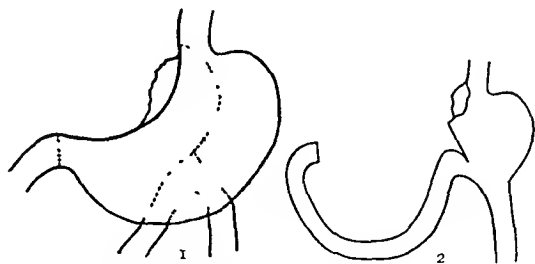


Fig 1 Grooved gastrectomy of Pauchet

Fig 2 Procedure of Wells

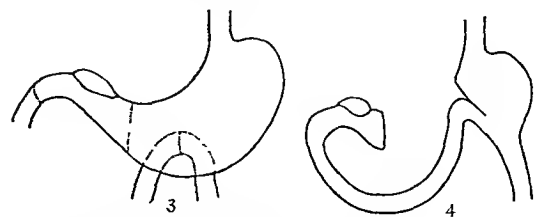


Fig 3 Ancient pylorectomy

Fig 4 Resection by exclusion according to Finsterer

and the tumor was removed. The open end of the stomach was closed by over and over catgut sutures and inversion obtained by a second row of catgut sutures reinforced with interrupted silk sutures. The stump of the esophagus was then transplanted into the anterior wall of the stomach through an incision placed several centimeters below the point of division of the stomach. The anastomosis was completed by an inner mucosal layer of interlocking catgut re-enforced by serosal sutures of interrupted silk. This anastomosis is appeared to be entirely satisfactory and the stoma would easily admit one finger. The edges of the incision in the diaphragm were approximated to the stomach inferior to the anastomosis. The stomach was placed partially in the intrathoracic region and the incision in the diaphragm was closed so there would be no possibility of the herniation of abdominal contents into the pleural cavity. This suture row was re-enforced by interrupted sutures of silk. A catheter was placed in the thorax through a stab wound sutured to the posterior parietal pleura, and attached to a constant suction apparatus for drainage. The thoracic wound was then closed.

Microscopic study of the tumor revealed that the lesion was an adenocarcinoma with metastasis to two of five lymph nodes. Blood transfusions were administered during and following the operation. Convalescence was stormy for the first twenty-one days after the operation and the patient required repeated bronchoscopic examinations in order to remove the mucous accumulation in the air passages. Eleven days after operation spontaneous rupture of the wound occurred and secondary closure was necessary and was safely accomplished.

The patient was dismissed from the hospital on the fortieth day the wound was healed and he was feeling comfortable. He was able to swallow satisfactorily and was taking five feedings daily.

Following dismissal from the hospital he was seen at intervals. He had some difficulty with a choking sensation which was present at all times and not aggravated by swallowing. Esophagoscopy was performed because of persistent esophageal obstruction. The upper part of the esophagus was found to be dilated and inflamed. The esophageal opening into the stomach was about 1 cm. in width and did not dilate readily. After dilatation the patient experienced relief and was able to swallow satisfactorily. He was last seen in the clinic seven months after the operation at which time he was able to swallow quite well but complained of some pain in his chest.

JOSEPH K. VARAT, M.D.

MISCELLANEOUS

Lanzillo F. Surgery of the Diaphragm. I. Surgical Anatomy (*Chirurgia del diaframma. I. Anatomia chirurgica*). *Rassegna interna di clin e terap.* 1938 59 512.

The author presents a detailed review of the anatomy and surgical relationships of the diaphragm. He no longer believes that this structure simply divides the abdomen from the chest. He rather believes it to be one of the important structures in what might be called the thoraco-abdominal portion of the body as represented by the portion between two hypothetical horizontal lines, one marking the lower level of the diaphragm, the other the upper level.

A. LOUIS ROY, M.D.

Before proceeding with the subject matter of these experiments, it might be well to refer briefly to the terminology used. The term "simple obstruction" refers to the occlusion of the lumen of the howel without gross interference with the mural blood supply. The term "strangulation obstruction" implies a vascular impairment of the wall of the bowel and its mesentery. The author points out that at operation or autopsy, patients for whom the diagnosis was made clinically not infrequently showed some evidence of both types of obstruction. Most strangulation obstructions are accompanied by a simple mechanical or neurogenic obstruction. Because of a rather frequent combination of simple and strangulation types, with their overlapping syndromes, many patients observed clinically fail to present typical symptoms of either type of obstruction. Consequently, the surgeon and clinician find it rather difficult to realize that two entirely different physiopathological processes might be responsible for producing the many complex effects of intestinal obstruction.

The author ingeniously employed four methods in producing the experimental strangulation obstructions recorded in this paper, in order to make it possible to evaluate the rôle that the arteries and veins may play, individually and collectively, in determining the period of survival of dogs with strangulation obstruction. In his first method a partial occlusion of lumen and blood supply was employed. This group represented obstruction by encirclement only. In the second, there was complete arteriovenous obstruction. The third featured complete arterial obstruction with a patent vein, while the fourth featured complete venous occlusion with an intact artery. These four methods make possible an interesting comparative study.

The author gives a detailed account of the pathological and microscopical findings of each group and lists the results in tabulated form. Naturally, marked differences were noted in the various groups. The gross pathological picture, as well as the microscopic observations in all instances, however, indicated a loss of whole blood in the wall and lumen of the strangulated loop of the bowel. It was found that the relative degree of venous or arterial occlusion determined the type of strangulation produced. With venous occlusion predominating, the loss of whole blood was the chief factor. With arterial occlusion predominating, the loss of plasma was important.

Increase in the weight of the strangulated howel over the normal weight was likewise observed by the author. This increase in weight was shown to be due to the accumulation of blood in the wall and lumen of the strangulated loop of the bowel. Further observations showed that the hemoglobin content of the material within the loop was high and that the free peritoneal fluid was similar in total protein content to the animal's own blood plasma.

The author was able to calculate the loss of blood in strangulation obstructions. This loss of blood,

in the venous types of occlusion at least, was found adequate to account for the shock and death of the experimental animal. Experiments in these instances tended to show that the blood pressure falls rapidly and the hemoglobin content drops rather uniformly.

Furthermore, the author established the fact that there was a definite correlation between the fall in the blood pressure and the time, length, and type of intestinal strangulation. In general, the longer the time and the longer the loop strangulated, the greater was the fall in the blood pressure. The type of obstruction, however, was of even greater importance. In those instances in which the veins alone were ligated, and in the strangulations involving encirclement in which the arteries were not entirely occluded, the fall in pressure was much more rapid than in those instances in which the arteries were absolutely occluded, with or without occlusion of the veins.

Additional experiments were presented to demonstrate that "toxic products" are not present in the peritoneal fluid except terminally when the loops are gangrenous or ruptured. In view of the controversy concerning the absorption of so-called "toxic products" from the obstructed howel, it was deemed advisable to test the absorptive power of the normal and of the strangulated intestine for products of known toxicity. Histamine, strychnine, and tetanus toxin were introduced into strangulated loops (the usual four types of strangulation were employed) in order to test the absorption of these products. Careful experiments were carried out to make a complete check-up from this angle. Practically all the tests failed to reveal any evidence of absorption of these products, except terminally, when the loops were gangrenous or ruptured.

Later experiments were carried out which tended to show that the intestinal wall *per se* is not toxic. In order to determine whether the wall of the howel itself was "toxic," an attempt was made to free the normal intestine of the dog from its usual bacterial flora by chemical and thermal sterilization. Segments of howel thus treated were placed in the peritoneal cavities of normal dogs, in order to determine their relative and actual degree of "toxicity," as judged from a clinico-experimental standpoint. These experiments substantiated the experimental results of other investigators, notably Dragstedt and his co-workers, who showed that it was extremely difficult to sterilize the normal howel with the usual antiseptics. Careful bacteriological studies were then conducted and these tended to show that the only evidence of toxic absorption was found late in the course of any strangulation obstruction and was apparently due to the presence of innumerable bacteria in the peritoneal cavity. The author observed that the effect of the bacteria was apparently quantitative, as gross perforation of the intestine was essential to a lethal issue when the peritoneal fluid was tested by introducing it into the peritoneal cavity of a normal animal.

have found this two stage operation very satisfactory
SAMUEL J. FOGELSON M.D.

Bonne C. Hartz P. H. Herks J. V. Posthuma J. H. and Others The Morphology of the Stomach and Gastric Secretion in Malays and Chinese and the Different Incidence of Gastric Ulcer and Cancer in These Races *Am J Cancer* 1938 33 265

The low incidence of gastric ulcer and carcinoma among Malays as contrasted to the incidence among the Chinese living in Java has been previously reported but no definite attempt has been made to explain the difference. A few speculative theories have been advanced. The diet of the Malay is much more vegetarian in character than that of the Chinese, but this general statement cannot be taken as a starting point for a serious investigation because there are no analogous observations among other groups of individuals living largely on a vegetarian diet. The same criticism arises with regard to the difference in consumption of alcoholic beverages which consumption as a rule, is lower among the Malays than among the Chinese. The Malays who are almost all Mohammedans do not eat pork. This cannot be a factor because many Jews exclude pork from their diet and still neither gastric carcinoma nor gastric ulcer is less prevalent among them than among gentiles. The absence of physical emotion is characteristic of the Malay race. This has been suggested as a possible influence of the anatomical nervous system on the formation of ulcer. When this phase of the subject was investigated with Danielopol's atropine test no definite preponderance was found in either race.

In 951 Chinese autopsies 23 gastric and 17 duodenal ulcers were found. In 312 Malay autopsies, 8 gastric and 12 duodenal ulcers were found.

This study first concerned itself with detailed histological findings of the stomach. The stomachs of the two races showed grossly little or no difference in size. Histologically the distribution of glands was also found for practical purposes to be the same. From a detailed careful study the authors concluded that although there was a great difference between gastric pathology of the Chinese and that of the Javanese with regard to the major lesions such as gastric carcinoma and gastric ulcer the minor lesions also demonstrated an interesting finding.

Chronic atrophic gastritis and goblet cell metaplasia were also distinctly higher among the Chinese than among the Malays but generalized gastritis and erosions were more or less equally frequent in both races. The rarity of gastric ulcer in the Javanese is due not to relative absence of erosions but to the absence of some deleterious factor that in Europeans and Chinese leads to ulcer formation on the basis of erosion.

Further studies on gastric secretion which involved acid values pepsin content total base sodium potassium calcium magnesium chloride emptying

time, and plus nitrogen showed little or no difference except with regard to the nitrogen values which were somewhat higher in the Chinese.

Summarizing these findings we may be tempted to conclude that in the pathogenesis of ulcer there are two stages. The first in which atrophic gastritis and the formation of superficial erosions are present occurs equally frequently in both races but the second or the destructive process is arrested in the Javanese by some unknown factor and the formation of true ulcer is prevented.

SAMUEL J. FOGELSON M.D.

Scott H. G. Intestinal Obstruction Experimental Evidence on the Loss of Blood in Intestinal Strangulation *Arch Surg* 1938 35 816

Numerous attempts have been made in the past to ascribe the disastrous effects of all types of intestinal obstruction to some one etiological factor. Of the numerous explanations offered that of intestinal toxemia has been given the greatest consideration. Hundreds of investigators have attempted to put the blame on this or that toxin as being directly responsible for the dire results. There was never at any time any agreement as to what toxin was responsible. Moreover the fact that no theory of intestinal toxemia has ever offered any benefit to the patient in the way of improved methods of treatment or lowered mortality has cast grave doubt on this explanation. However, so firmly has the theory of intestinal toxemia become rooted in the consciousness of medical practitioners that the concepts advanced in more recent years have been but slowly and hesitatingly accepted.

During the past thirty years investigators have shown anatomically and pathologically at least that intestinal obstruction may be divided into two major types or a combination of the two. Clinicians and investigators alike have used the terms simple obstruction and strangulation obstruction to designate and differentiate the two major forms. Of recent years such investigators as Wilkie, Murphy, Elinan, Scott, Blalock and Messing have called attention to the fact that the loss of blood in intestinal strangulation may be of some consequence in bringing about and aggravating symptoms of shock and in causing death. Wilkie in 1923, clearly distinguished between simple and strangulation obstruction. He was impressed with the amount of blood lost in strangulation obstruction and believed that it played an important rôle in the causation of shock and death. While conducting some experiments on strangulation obstruction in the dog the author observed significant loss of blood into the walls and lumen of the strangulated bowel. The present paper by the author is the outcome of further experiments which he conducted in order to determine the extent of the loss of blood and its relation to changes in the blood pressure, shock and death as seen in these conditions. In this paper the results of 240 experimental strangulation obstructions are presented.

In addition, 4 other patients were operated upon. One patient had a large gastric ulcer of the lesser curvature, the second a postpyloric duodenal ulcer on the lesser curvature, the third a duodenal obstruction secondary to duodenal ulceration, and the fourth a large duodenal ulcer of the posterior wall which was adherent to the pancreas. The response to surgery was very satisfactory in all of these patients. They presented acid values which remained either within the normal limits or were slightly lower, but the mucin content of the gastric secretions was 2.2 mgm per ccm as contrasted to the normal averages of from 4 to 7 mgm which were previously reported by Anderson and Fogelson.

SAMUEL J. FOGELSON, M.D.

Cutler, C. W., Jr.: Changing Methods in the Surgical Treatment of Peptic Ulcer. *Ann Surg*, 1938, 108: 68.

The various changes leading to the present routines utilized for the treatment of ulcer in the Roosevelt Hospital, New York, are summarized by the essayist.

As early as 1907 Brewer reported 17 cases operated upon by him at Roosevelt Hospital. At that time he deplored the inadequacy of diagnostic methods and treated "simple round ulcer" medically for six weeks. After this period surgery was advised if the patients were "unrelieved." Between 1912 and 1914, Brewer and Cole proceeded to improve their diagnostic technique so that they were able to make accurate diagnoses in 89 per cent of the cases. This diagnostic aid led to greater activity on the part of the surgeons of the Roosevelt Hospital.

In 1915 Peck reported 134 operations on the stomach for benign lesions performed at the Roosevelt Hospital between 1910 and 1915. He pointed out that gastro-enterostomy was the routine treatment for chronic duodenal ulcer, having been performed in 72 of 74 cases with a surgical mortality of 8.1 per cent. From 58 of these cases which could be traced subsequently he estimated that 68.9 per cent of all the patients who were operated upon were cured.

Over the period of ten years from 1917 to 1927, the number of surgical interventions for duodenal ulcer increased. Four hundred and twelve gastro-enterostomies were performed. At this time the surgeons believed that peptic ulcer was essentially a surgical disease and that the surgical treatment was in the main satisfactory. However, as early as 1924, Peck had reached the conclusion that these patients should have a thorough and intelligent trial of medical treatment before surgery was considered. At this time he reported on 196 cases of chronic duodenal ulcer in which he performed 191 gastro-enterostomies. The surgical mortality was 8 per cent. Even then Peck made mention of the fact that resection was being considered after primary gastro-enterostomy in the more severe cases. He believed that "routine resection is not indicated." We do not believe that gastro-enterostomy should go into discard in the treatment of duodenal ulcer,

nor do we believe that extensive resections of the normal stomach are justifiable for this lesion. We are unconvinced that resection to prevent the formation of gastrojejunal ulcer is a proper procedure for the 98 cases who do not need it to possibly avoid its occurrence in the other 2.

Peck's report from 1924 to 1937 showed that at the Roosevelt Hospital 262 operations for chronic ulcer of the stomach or duodenum, exclusive of operations for acute perforations of primary ulcer, were performed. "It is of interest to note that year by year the number of operations performed for this condition has gradually diminished and this without a significant diminution of the number of cases admitted." In 1926 there were 46 such operations, whereas in 1936 there were but 12.

It is now the practice at the Roosevelt Hospital to consider all cases of chronic peptic ulcer as medical problems and Cutler agrees with Oschner, who says, "It is our firm conviction that there is no surgical treatment of peptic ulcer and that surgery is indicated only when there are complications." No patient is now operated upon at Roosevelt Hospital for chronic peptic ulcer without having had a thorough controlled and efficient course of medical management. In each case in which operation is proposed, this action must be approved by a court consisting of physician, surgeon, gastro-enterologist, and roentgenologist. The criteria for surgery are:

- 1 Persistence of pain in spite of a trial of adequate medical management
- 2 Persistent or recurring pyloric obstruction
- 3 Massive recurrent hemorrhage in which fatality is feared
- 4 Recurrent hemorrhage even if the symptoms are controlled by treatment.
- 5 A lesion of the stomach which appears intractable to adequate treatment or suggests the presence of malignancy.

The selection of the type of surgical intervention has shown a slow but definite change. The number of gastro-enterostomies has been slowly decreasing year by year whereas the resection type of operation has shown a gradual increase. This change is probably due to the fact that the patients not benefiting from medical therapy are those with scarred or sclerosed ulcers, ulcers penetrating the head of the pancreas, ulcers invading the blood vessels, ulcers which have caused duodenal or pyloric obstruction and occurred when the motor and secretory activity was marked and when the recurrence of ulcer was likely to be high. Chronic gastric ulcers are also treated by resection when the risk is not too great for the patient, because resection discourages the tendency toward recurrence and diminishes the probability of advancing malignancy, should there be any suspicion of cancer.

The mortality rate for resection in the last fourteen years has been 9.3 per cent as contrasted to the 8.5 per cent mortality of gastro-enterostomy during the same period. However, when one considers the 16 per cent of late poor results from gastro-enteros-

The author draws some interesting conclusions from his experiments which are of great significance. In the first place strangulation obstruction like intestinal obstruction in general is not a distinct disease. To quote the author: "The train of symptoms, the development of shock and finally the ensuing death depend on at least three factors:

1. Loss of blood into the wall of the bowel, the lumen and the peritoneal cavity.

2. Transudation of plasma into the general peritoneal cavity.

3. Absorption of bacterial toxins.

The course taken in any strangulation will depend on the relative degree of venous or arterial occlusion. If arterial occlusion predominates the resulting pathologic picture will be an anemic or hemorrhagic necrosis without marked distention of the lumen or the wall of the bowel. In these instances there will be an outpouring of plasma from the surrounding peritoneal surfaces in an attempt to rid the peritoneum of the gangrenous bowel. Death will occur relatively late and will be secondary to a loss of plasma into the peritoneal cavity and an absorption of bacterial toxins therefrom. If on the other hand the venous occlusion predominates in the face of normally patent pumping arteries or even partially patent arteries, the result will be a loss of whole blood into the wall and lumen of the bowel and a transudation of plasma into the peritoneal cavity associated with a distention of the strangulated loop, varying from a moderate to a marked degree.

From these observations it seems quite plausible to add that whole blood and plasma are apparently lost from the general circulation in quantities sufficient in themselves to account for the symptoms of shock and death which occur in most cases of strangulation obstruction. MARRIS J. SEEVER, M.D.

Donaldson J. K. Intestinal Obstruction. An Analysis of 200 Cases Attempting Improved Correlation of Mortality, Pathological Physiology, and Signs and Symptoms. *Am J Surg* 1935 40: 503.

In a recent discussion of intestinal obstruction the author stressed various morbid processes of the disease as they occur in different conditions ordinarily listed under the title of intestinal obstruction. He presented a simplified classification based upon pathological physiology. The chief efforts made in this present article are to analyze mortality rates and signs and symptoms in different types of obstruction with appreciation of the distinction between early and late signs.

The total mortality for all cases of intestinal obstruction was 58.8 per cent. The folded loop obstruction are more serious than the simple ones and the mortality was 71.4 per cent. In the simple obstruction the mortality was 59 per cent. In a case of mesenteric thrombosis the mortality was 100 per cent. In 3 cases of intussusception the mortality was 50 per cent. The seriousness of cases of gangrene was demonstrated by a mortality of 100 per cent.

One must remember that the interference with the arterial blood supply leading to gangrene gives the most fulminating picture in obstruction. Loss of salts is also an important factor but one which is easily combated. Distention may be a lethal factor in obstruction in that it may cause an ischemia of the mucous membrane allowing toxins to be absorbed. Loss of essential salts and fluids is likely to be more rapidly serious in obstructions which are situated high in the small gut than in lower large bowel obstructions.

The most reliable finding in direct lumen obstruction is available through the use of x-rays. Gas and fluid levels in the small bowel become characteristic in from three to six hours. Fluid levels will occur in direct lumen obstructions as in paralytic ileus. Under late signs and symptoms may be included distention, decreased peristalsis, marked rigidity (peritonitis) and shock with collapse.

JOHN W. NIZLY, M.D.

Berman J. K. Duodenogastric Intussusception. Its Clinical Application and Results. *Arch Surg* 1938 37: 139.

Berman made experimental duodenogastric intussusceptions in dogs by incising the pyloric sphincter longitudinally and then invaginating the pars superior duodeni into the pyloric antrum. He found that the invaginating portion remained in place for many months and showed no morphological changes. A procedure of this type places the ulcer-bearing area which consists of the pyloric end of the stomach and the first part of the duodenum into a new environment which is more highly acid.

A study of the animals prepared in this manner showed that Brunner's glands have two secretions: (1) a local protective mucin and (2) a systemic acid stimulating hormone. It was also shown that hydrochloric acid stimulates the local production of mucin as well as of gastrin and the production of the latter in turn leads to the secretion of hydrochloric acid, the cycle thus being perpetuated. It was also seen that the adventitious duodenal mucous membrane in these experimental animals showed no ulceration despite exposure to increased acidity and the rapid emptying time. The defensive mechanism afforded by the excess mucin secretion was believed to be the protecting factor.

The operation devised by the author has been tried clinically on 5 patients. The first patient was operated upon for a perforated duodenal ulcer of the anterior wall on February 2, 1936. The hepatogastric, hepatoduodenal and gastrocolic ligaments were divided up to the upper portion of the pyloric antrum and down to a point 1½ in. below the pylorus. This portion of the stomach and duodenum thus being mobilized and the pyloric sphincter was divided longitudinally down to the mucous membrane. The duodenogastric intussusception was then accomplished and the greater omentum placed over the operative field. The patient has remained well to date.

In addition, 4 other patients were operated upon. One patient had a large gastric ulcer of the lesser curvature, the second a postpyloric duodenal ulcer on the lesser curvature, the third a duodenal obstruction secondary to duodenal ulceration, and the fourth a large duodenal ulcer of the posterior wall which was adherent to the pancreas. The response to surgery was very satisfactory in all of these patients. They presented acid values which remained either within the normal limits or were slightly lower, but the mucin content of the gastric secretions was 2.2 mgm per ccm as contrasted to the normal averages of from 4 to 7 mgm which were previously reported by Anderson and Fogelson.

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The selection of the type of surgical intervention has shown a slow but definite change. The number of gastro-enterostomies has been slowly decreasing year by year whereas the resection type of operation has shown a gradual increase. This change is probably due to the fact that the patients not benefiting from medical therapy are those with scarred or sclerosed ulcers, ulcers penetrating the head of the pancreas, ulcers invading the blood vessels, ulcers which have caused duodenal or pyloric obstruction and occurred when the motor and secretory activity was marked and when the recurrence of ulcer was likely to be high. Chronic gastric ulcers are also treated by resection when the risk is not too great for the patient, because resection discourages the tendency toward recurrence and diminishes the probability of advancing malignancy, should there be any suspicion of cancer.

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tomy as against the 3 per cent of poor results from resection this slight increase in mortality is negligible

In summary at the Roosevelt Hospital New York the tendency has been to decrease the number of surgical interventions but if surgical intervention is selected it is generally of a more radical type

SAUEL J. FOGELSON M.D.

Chamberlin D. T. Malignant Tumors of the Small Intestine *Surg Clin North Am* 1938 18 705

Malignant tumors of the small intestine may be classified according to their gross characteristics into annular and asymmetrical tumors. The carcinomas are usually annular while sarcoma tends toward the expansive type of growth.

The diagnosis of malignancy of the small bowel is not often made before operation or post mortem. The extreme rarity of the condition discourages diagnosis. Rone and Marshall found reports in the literature of 339 tumors of the small bowel of which 38 (4.9 per cent) were malignant. Ackman reported 600 cases of intestinal carcinoma in the Montreal General Hospital of which only 7 were true carcinomas of the small intestine.

If carcinoma of the ampulla of Vater is included the duodenum leads as the most common site of carcinoma of the small bowel. The jejunum is next in frequency and the ileum last. The average age of all patients whose cases have been reported in the literature is from forty five to fifty years. The symptomatology varies with the size and character of the tumor and its position in the small intestine. The closer it is to the pylorus the more acute the symptoms are when obstruction sets in. The duration of symptoms may be as short as two months or as long as five years depending upon the character and position of the tumor. Carcinoma which occurs proximal to the ampulla of Vater produces symptoms that are in no way different from those present in pylorus obstruction due to any other cause. Cancer of the ampulla itself produces painless, uninterupted obstructive jaundice and dilation of the gall bladder and cannot be distinguished clinically from carcinoma of the head of the pancreas. Cancer occurring distal to the ampulla in the duodenum and upper jejunum results in slowly progressive obstruction with severe cramplike epigastric pain at its peak two or three hours after meals.

Tumors in the jejuno ileal region make themselves known by two groups of symptoms. In the first group there are vague symptoms fairly constant and progressive. Malaise, anorexia and weight loss are usually present. Anemia is a frequent symptom. The pain is shifting, dull and cramp like in character. As the lumen of the bowel is encroached upon vomiting once or twice a week may occur with partial relief of the symptoms. One type of malignant tumor does not obstruct but grows away from the lumen of the bowel. In such cases the only finding will be a hypochromic anemia until the mass grows large enough to be palpable.

The prognosis of carcinoma of the small bowel is generally poor. The cancer has a tendency toward early metastasis to the mesenteric lymph nodes, peritoneum, liver, lungs, bones and spinal dura in the order named. X ray findings often make a diagnosis possible only after metastasis has taken place. Kiefer gives the average duration of life after resection as one year and in his report of a series of 11 cases of malignancy of the small bowel there was only 1 patient alive five years after a resection for carcinoma of the jejunum.

The treatment is entirely surgical and the most difficult part of the problem is to recognize the lesion early enough for a hopeful prognosis.

During the past five years there have been 11 cases of malignant tumor of the small intestine of which only 4 were diagnosed as such before operation. Six patients were found to have carcinoma and 3 lymphosarcoma. All 9 patients were operated on for obstructive symptoms. The 3 cases of lymphosarcoma were all in younger patients. The earlier appearance of lymphosarcoma is frequently noted in the literature. The lymphosarcomas take a very rapid course so that there is not time for the development of a profound anemia before obstructive symptoms supervene. The x ray examination of the small intestine is carried out by means of a barium meal on a fasting stomach and films of the abdomen taken at hourly intervals for six hours. The author reports 9 cases of malignancy of the small bowel which came to operation in the Lahey Clinic, Boston.

JOHN W. NUTTER M.D.

Bower J. O., Burns J. C. and Mengle H. A. The Bacteriology of Spreading Peritonitis Complicating Acute Perforative Appendicitis. *Surgery* 1938 3 645

The authors review the literature on the bacteriology of peritonitis of appendiceal origin with particular reference to the significance of the gas producing anaerobes in the pathogenesis of this disease. They obtained exudate from 55 cases of gangrenous appendicitis with spreading peritonitis. This material was transferred to media and incubated aerobically and anaerobically. Phosphorous combustion was used for the production of anaerobiosis. Anaerobic cultivation was performed only on material which had been heated to 80° C. for fifteen minutes to destroy the non sporeforming bacteria which method prevented of course the identification of non sporulating anaerobes such as the anaerobic streptococci and also those anaerobes which form spores in media but not in the body.

The percentage incidence of individual organisms in relation to the total series is not reported but the proportion of total positive aerobic or anaerobic cultures in which the organism was found is indicated.

In this series colon bacilli were found in 50 per cent of the cases, streptococci of various types in 25 per cent and clostridium welchii in about 16 per cent.

The authors also studied the bacterial flora of induced peritonitis in dogs and, according to the statistical method used, found that the incidence of clostridium welchii in this lesion was similar to that in human peritonitis. Organisms found in lesions of living dogs are compared with the flora in dogs dying of peritonitis. The incidence of bacillus coli infection appeared to be considerably higher in human peritonitis than in dog peritonitis.

The authors mention briefly their conviction that the strains of clostridium welchii encountered were actively pathogenic and contributed to the toxemia of the peritonitis, but they state that the complete data on this point will be published in a separate paper.

JOHN S. LOCKWOOD, M.D.

Cave, H. W.: The Surgical Treatment of Intractable Chronic Ulcerative Colitis. *Ann Surg*, 1938, 107, 806

The permanent cure of extensive intractable chronic ulcerative colitis demands the complete removal of the diseased bowel. Less radical measures have proved inadequate. Medical management, which has consisted principally of rest in bed, a caloric-high-vitamin and low-residue diet, irrigations, the elimination of focal infections, and the use of vaccine and serums, has for the most part, been ineffectual. The percentage of lasting or permanent cures has been exceedingly small, therefore colectomy, partial or total, is a measure of necessity.

The indications for surgery are discussed. Apart from the acute emergencies of impending perforation or massive repeated hemorrhage, surgical treatment should be withheld until two factors have been evaluated: the clinical response to conservative treatment, and the degree and extent of permanent damage to the colon. Failure to achieve definite clinical improvement by the various conservative measures, persistence and progression of the lesions as seen at proctoscopy, and roentgenological evidence of progressive fibrosis of the colon with pseudopolypoid degeneration of the mucosa constitute the elective indications for surgery.

Appendicostomy, cecostomy, and colostomy are considered by the author to have no place in the management of intractable chronic ulcerative colitis. In his experience, these procedures are not curative or even palliative, and they complicate subsequent radical surgery when and if this becomes necessary. Partial colectomy is justified in well selected cases in which the disease is definitely limited to one portion of the colon, the Mikulicz type of resection is ideal and relatively safe. If the rectum and lower sigmoid are involved alone, a combined abdominoperineal resection in two stages will minimize the complication of peritonitis.

Ileostomy as a curative measure has been discarded. Diversion of the fecal current may produce a striking clinical improvement, yet the toxemia, although temporarily diminished, persists and the patient is not cured until the infected colon is removed.

Colostomy is of value in diverting the fecal stream, particularly in cases in which only the lower sigmoid and rectum are involved, and in many instances assures the patient of less inconvenience than ileostomy.

Ileosigmoidostomy, preferably end-to-side, as a first-stage measure prior to subtotal colectomy has been successfully utilized, however, there is grave danger that by such a measure the disease process may extend into an otherwise healthy rectum. The author emphasizes the fact that it is only in an exceedingly small group of cases (less than 10 per cent) of segmental colitis that ileosigmoidostomy is ever justified. He considers it important to state clearly that this procedure is unwarranted if the descending colon and rectum show the slightest involvement.

The entire diseased large intestine can be removed without great risk. Pre-operative preparation is important and must be carefully and thoroughly carried out. Repeated small transfusions are suggested, also adequate intravenous administration of glucose in saline, colonic irrigations with warm saline solution, low residue or non-residue diet, and the administration of lead and opium.

Three separate stages (occasionally four) are usually required to perform a total colectomy.

First stage. Transverse permanent ileostomy 6 in from the ileocecal valve through a right McBurney incision. The distal end of the divided ileum is dropped back into the abdominal cavity, if stricture of the colon exists, it is preferable that a mucous fistula of the distal divided end be established.

Second stage. At least from five to eight weeks, and even more time, should elapse between the first and second stages, to insure the establishment of water balance. A long left paramedian incision is made. The small segment of terminal ileum, and the ascending, transverse, descending, and upper sigmoid colon are removed and only approximately 4 in. of the lower sigmoid above the peritoneal reflection are left. The stump may be sutured in layers, or it may prove safer to suture the open lower sigmoidostomy to the anterior abdominal wall.

Third stage. Combined abdominoperineal resection in one stage, from two to six months after the second stage, to permit of satisfactory rehabilitation.

In a few selected cases a two-stage maneuver may possibly meet the requirements. This possibility is predicated upon the proven presence of a normal sigmoid and rectum, and the first stage consists of end-to-side ileosigmoidostomy, and the second of subtotal colectomy. In cases in which the left colon and rectum alone are diseased, a two-stage procedure is all that is necessary: first, a transverse colostomy with removal down to the lower sigmoid and second, a combined abdominoperineal resection.

Occasionally, in the patient who is a particularly bad risk, four stages are safer. The second stage would then consist of removal of the ascending and transverse colon, the splenic flexure to be left in place, and then removal of the descending and upper sigmoid colon for the third procedure.

A résumé of the case histories of 6 colectomized patients is presented. In this series (carefully and frequently observed since operation) it has been found that the patients manage the ileal stoma with out undue inconvenience, their mental attitude is surprisingly cheerful and they possess a feeling of well being due no doubt to their extraordinary gain in weight. No permanent deleterious results have been found to occur following colectomy.

JOHN H. CARTLOCK, M.D.

Charrier and Goumain: Villous Tumors of the Rectum (Tumeurs villoses du rectum) *Bordeaux chir.* 1938 9 77

Charrier and Goumain have observed 5 cases of villous tumor of the rectum. On the basis of their findings they discuss the histology, symptomatology and treatment of this type of tumor.

The tumors may be pedunculated or sessile, the pedicle if present is usually short. Or they may occur in the form of multiple vegetations rather than a single tumor.

When benign these tumors never invade the muscularis mucosae but arise from the chorion. They consist of multiple villi lying in all directions, each villus is formed of vascular connective tissue arising from the chorion and covered with epithelium; the epithelium shows two types of cells, dark colored cylindrical cells and muciparous cells. The latter are similar to those found normally in the intestines, but are unusually numerous in these tumors and secrete an abundance of mucus which covers the surface of the tumor. Malignant changes in these tumors take place very gradually, the first change noted is in the cylindrical cells which become flatter and more cuboid, the nuclei become oval, stain less intensively and show numerous irregular mitoses. At the same time the function of mucus secretion disappears, this was a notable feature in the authors' third case, which was the only one in their series to show malignant changes. Then the neoplastic process advances and modifies the entire architecture of the tumor, which becomes infiltrating and invades the muscularis mucosae, invasion of the lymphatics does not occur until a later stage. There is another type of villous tumor of the rectum, the dendritic villous tumor, which does not represent a malignant degeneration of a benign tumor but is primarily malignant, it does not arise from the superficial layers of the chorion, but from a depression in the chorion, and its epithelial cells are atypical, polymorphous and definitely neoplastic from the first. None of the authors' cases were of this type.

The chief symptom of villous tumors of the rectum of the benign type is the discharge of mucus, this discharge is clear and slightly viscous like the white of egg. Bleeding may occur but it is usually slight. The copious discharge of mucus if mixed with fecal matter and causing a desire to defecate may simulate a diarrhea, but in reality there is little if any change in the consistency of the stools and no true diarrhea.

If the tumor is benign it causes no pain even at defecation, if pain is noted it suggests a malignant degeneration. The general condition of the patient with a benign villous tumor is good, there is rarely enough bleeding to cause secondary anemia. The tumor can be palpated with the finger in the rectum in 90 per cent of the cases. However it is best studied with the proctoscope because even if it is large it is yielding and elastic so that it offers little obstruction to the passage of the instrument. The condition of the rectum above as well as below the tumor can be observed.

The treatment of these tumors is surgical. If biopsy has shown no signs of malignant degeneration removal of the tumor with a margin of normal tissue gives good results. For this operation the anus should be well dilated and spinal anesthesia should be used if the patient's cardiovascular condition permits. As the tumors are vascular and there is apt to be considerable hemorrhage the authors prefer the use of the electric cutting current as the best means of controlling the bleeding. They used this method in 3 of their cases. In 1 case there was a recurrence within seven months, this recurrent tumor showed signs of beginning malignant degeneration consisting of the absence of muciparous cells and malignant changes in the cylindrical cells but no infiltration of the deeper tissues. In this instance a perineal amputation of the rectum was done. The authors recommend this operation only in those cases in which evidence of malignant change is found by biopsy. *ALICE M. MERRIS*

D. Allaines, F. Jourdan, P. and Stefani: L. Surgery of the Rectum by the Transsacral Route (La chirurgie du rectum par la voie trans sacrée) *J. de chir.* 1938 51 817

D. Allaines, Jourdan and Stefani note that the transsacral route for operations on the rectum (Kraske's method) has practically fallen into disuse in France but it has certain advantages which they point out. The transsacral route gives a more direct approach to the ampulla, greater facility in the closure and suture of the peritoneum and an easier approach to the superior vascular pedicle.

In cases in which the lower limit of the tumor is less than 4 cm. above the levator ani muscles an amputation and not a resection of the rectum is definitely indicated. In such cases the transsacral route has certain advantages for some of the steps of the operation, especially for the removal of the rectal sheath. In these cases a combined perineo-sacral method may be employed. In cases in which the lower limit of the tumor is 4 cm. or more above the levator muscles it may be possible to re-establish the continuity of the intestines and avoid a permanent artificial anus. The Kraske method gives the much better approach when this operation is indicated. Whether it is possible can often be determined only at operation and for that reason it is preferable to use the transsacral approach whenever there is a possibility that the continuity may be re-established.

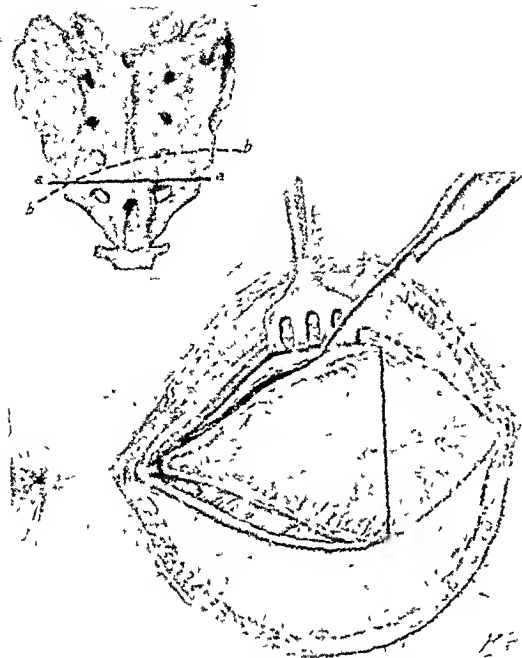


Fig 1 Liberation of the sacrum, in the inset, the lines indicate two types of resection, (a) minimum, (b) large

When this is the case a temporary artificial cecal anus must be established at least three weeks before the main operation

For the transsacral operation, the patient lies on the left side with the pelvis raised and the thighs flexed on the abdomen, giving an easy approach to the sacrum. The skin incision begins about midway between the anus and coccyx and is carried upward in a slight curve to the base of the sacrum. After section of the sacrum, the rectal sheath may be entirely removed and the upper portion of the rectum and the tumor freed and drawn out through the operative wound. The peritoneum is opened, which may present some difficulty, especially in the male and should be done at some distance from the tumor. The superior hemorrhoidal artery is then ligated. The lower part of the rectum is then freed so as to permit an extensive resection of the tumor. If a sufficiently extensive resection of the tumor cannot be done, to leave at least 4 cm. of healthy tissue below it, amputation of the rectum is indicated. The peritoneum is closed before section of the intestine. The method of terminating the operation depends upon the general condition of the patient, and the extent of the resection. If sufficient intestine remains, immediate end-to-end suture of the colon to the ampulla may be done. In other cases, if the colon is long and most of the rectum has been removed, Hochenegg's technique of invagination of the colon in the anus may be employed. In some

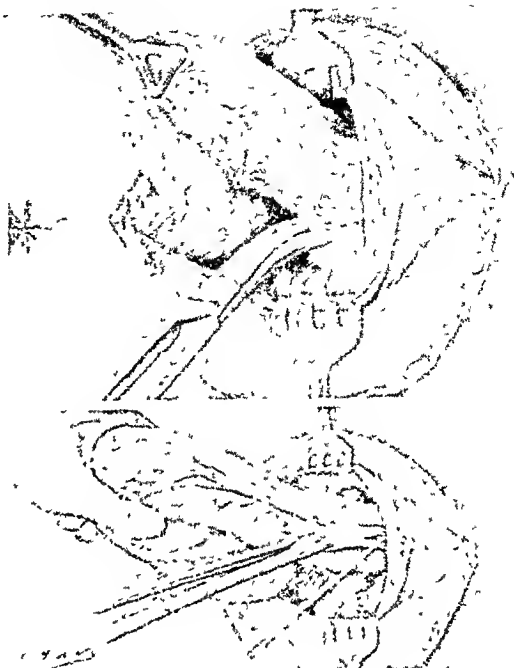


Fig 2 Above Opening the peritoneal cul-de-sac Below ligature of the superior hemorrhoidal artery

cases a sacral anus must be formed, and a continuity of the intestines re-established at a second operation, after a sufficient prolapse of the intestine has occurred, usually in from six to fifteen months. This gives the least satisfactory results, but is sometimes the only method possible.

In some cases a combined abdominosacral method is employed, on the same principle as the combined abdominoperineal method. The abdominal operation is done first, to facilitate the liberation of the pelvic colon. When rectal amputation is indicated the combined perineosacral method is employed. Seventeen cases are reported in which the transsacral route was employed in cancer of the rectum with only 3 postoperative deaths, 1 due to infection and the 2 others to shock. In most cases there was little or no postoperative shock.

ALICE M MEYERS

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Biasini, A. Occlusion of the Hepatic Artery and of the Common Duct (Occlusioni dell'arteria epatica e del coledoco) *Arch Ital di chir*, 1938, 48 277

The author states that hepatic function has been the subject of numerous studies during the last few years. In the present investigation, Biasini is primarily interested in the modifications of hepatic function resulting from the ligation of the hepatic artery and of the extrahepatic bile passages.

A resume of the case histories of 6 colectomized patients is presented. In this series (carefully and frequently observed since operation) it has been found that the patients manage the ileal stoma without undue inconvenience, their mental attitude is surprisingly cheerful, and they possess a feeling of well-being, due no doubt to their extraordinary gain in weight. No permanent deleterious results have been found to occur following colectomy.

JOHN H. GARLOCK, M.D.

Charrier and Goumain: Villous Tumors of the Rectum (Tumeurs villoses du rectum) *Bordeaux chir.* 1938, 9, 77

Charrier and Goumain have observed 5 cases of villous tumor of the rectum. On the basis of their findings, they discuss the histology, symptomatology, and treatment of this type of tumor.

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If the tumor is benign, it causes no pain even at defecation; if pain is noted it suggests a malignant degeneration. The general condition of the patient with a benign villous tumor is good; there is rarely enough bleeding to cause secondary anemia. The tumor can be palpated with the finger in the rectum in 80 per cent of the cases. However it is best studied with the proctoscope because even if it is large, it is yielding and elastic so that it offers little obstruction to the passage of the instrument. The condition of the rectum above as well as below the tumor can be observed.

The treatment of these tumors is surgical. If biopsy has shown no signs of malignant degeneration, removal of the tumor with a margin of normal tissue gives good results. For this operation the anus should be well dilated and spinal anesthesia should be used if the patient's cardiovascular condition permits. As the tumors are vascular and there is apt to be considerable hemorrhage the authors prefer the use of the electric cutting current as the best means of controlling the bleeding. They used this method in 3 of their cases. In 1 case there was a recurrence within seven months; this recurrent tumor showed signs of beginning malignant degeneration consisting of the absence of muciparous cells and malignant changes in the cylindrical cells but no infiltration of the deeper tissues. In this instance a perineal amputation of the rectum was done. The authors recommend this operation only in those cases in which evidence of malignant change is found by biopsy. (Luce M. Maynard)

D. Allaines, F. Jourdan, and Stéfani: Surgery of the Rectum by the Transsacral Route (La chirurgie du rectum par la voie trans sacrée) *J. de chir.* 1938, 51, 819

D. Allaines, Jourdan, and Stéfani note that the transsacral route for operations on the rectum (Kraske's method) has practically fallen into disuse in France but it has certain advantages which they point out. The transsacral route gives a more direct approach to the ampulla, greater facility in the closure and suture of the peritoneum and an easier approach to the superior vascular pedicle.

In cases in which the lower limit of the tumor is less than 4 cm. above the levator ani muscles an amputation and not a resection of the rectum is definitely indicated. In such cases the transsacral route has certain advantages for some of the steps of the operation, especially for the removal of the rectal sheath. In these cases a combined perineo-sacral method may be employed. In cases in which the lower limit of the tumor is 4 cm. or more above the levator muscles it may be possible to re-establish the continuity of the intestines and avoid a permanent artificial anus. The Kraske method gives the much better approach when this operation is indicated. Whether it is possible can often be determined only at operation and for that reason it is preferable to use the transsacral approach whenever there is a possibility that the continuity may be re-established.

in 11 the condition had occurred primarily in the gall bladder (all cylindrical-cell carcinomas). Eight of the patients had died in the fifth, 11 in the sixth, and 14 in the seventh decade of life. The youngest had been thirteen years and the oldest seventy-seven years of age.

In many instances, in addition to local infiltration or spread of the condition by way of the lymph and blood vessels, metastases had occurred in the regional lymph nodes or in distant organs. Practically all of the patients with primary liver growths had had cirrhosis of the liver with ascites. The majority of patients with primary growths in the extrahepatic ducts and in the gall bladder had had cholelithiasis. With few exceptions, the patients had been jaundiced. The average duration of illness had been four and one-half months.

Earlier reports on neoplasms of the biliary system show that the incidence of primary carcinoma of the liver varies in different geographical locations. Similar variation seems to exist with regard to the site of the primary growth. The authors' series is remarkable in that the primary carcinomas of the liver had a high incidence and far outnumbered the carcinomas which were primary in the extrahepatic biliary ducts and in the gall bladder.

The series is furthermore unusual in that practically all of the patients with primary carcinoma of the liver had cirrhosis of the liver with ascites, irrespective of the histological structure of the growths. Few of them had cholelithiasis, whereas the majority of the patients with primary growths in the extrahepatic biliary ducts and in the gall bladder had cholelithiasis. Jaundice occurred in practically all of the cases, irrespective of the site or the histological type of the primary growth.

JOSEPH K. NARAT, M.D.

Craft, C. B.: The Effect of Ephedrine on Pancreatic Secretion: A Method for the Management of Patients Having a Pancreatic Fistula. *Surgery*, 1938, 4: 64.

The results of animal experimentation clearly indicate that 10 mgm. of ephedrine given subcutaneously decrease the volume output of pancreatic juice. This observation agrees with the action of epinephrine on pancreatic secretion. Like epinephrine, ephedrine probably produces its inhibitory effect on the secretion of pancreatic juice through its vasoconstrictor action on the blood vessels of the pancreas, which results in a decrease in the minute flow of blood to the pancreas and a decrease in secretion of pancreatic juice. Ephedrine begins to exert its vasoconstrictor action about ten to fifteen minutes after injection and continues to exert its effect for the next twenty or thirty minutes.

In the doses used to decrease the secretion of the pancreas, ephedrine produced no toxic manifestations in animals. Ephedrine is a drug which should be tried for the reduction of pancreatic secretion in cases of pancreatic fistula. The amount of ephedrine that would be required to reduce the secretion of the

pancreas in man cannot be stated, however, a single dose of 400 mgm., or the administration of 150 mgm. every three or four hours during the day and night has produced no serious results.

Silica gel has proved to be very valuable in the control of the skin excoriation and tissue digestion in two clinical cases. It has been used on the theory that it absorbs enzymes. It is a neutral powder, very soothing, non-irritating, and easily applied.

SAMUEL KAHN, M.D.

Nordmann, O.: Newer Views on Acute Pancreatic Necrosis and Its Treatment (Neuere Anschauungen ueber die akute Pankreasnekrose und ihre Bekämpfung). 62 Tag d. deutsch. Ges. f. Chir., Berlin, 1938.

In view of evidence derived from pathological anatomy and physiology, the term pancreatitis is incorrect and pancreatic necrosis should be substituted, since autodigestion of the gland is important at the outset of pancreatic edema, and even more important in its later stages. The condition is secondary to gall stones or to gall-bladder disease without stone. Stone in the ampulla is much rarer than is usually believed. The mechanical origin of pancreatic necrosis from the entrance of bile into the pancreas is not the chief cause of necroses. If a communication exists between the pancreatic and common bile ducts, pancreatic juice probably passes over into the bile duct because of the higher pressure, where it becomes activated and then, by diffusion or backflow, causes autodigestion of the gland. Much more important than the ductal origin are functional disturbances, altered circulation, stasis, protein decomposition, leucocytic extravasation, in short, circulatory disturbances and fermentative processes. There are gradations from simple edema to total necrosis. Glandular inflammation occurs rarely, usually extending from adjacent organs to the peripancreatic glands, injuring the pancreas, and giving rise to necroses.

In diagnosis, the diastasis test is of primary importance, however it is absolutely positive only on the first to second days, prognostically it is of no value. The outlook is unfavorable only if it remains persistently high. Pansteking technique is a prerequisite for positive results. Lipase determination is as yet not reliable. Leucocyte counts occasionally elevated to as high as 50,000 are considered prognostically unfavorable. Non-protein nitrogen retention and anuria are not due to bacterial poisons but to protein destruction. Marked elevation of the blood sugar is a serious prognostic sign. Shock is due to protein decomposition products, cyanosis to paralysis of the vasomotors. Hematemesis, a bad omen, is due to backflow of the blood from the pancreas into the duodenum and, thence, into the stomach.

Drainage of the peritoneal cavity is of no avail. The exudate is sterile at first. Trypsin is not injurious and fat necrosis is of no significance. Exploratory laparotomy was done in 4 cases, and the

In surgical practice, ligation of the hepatic artery is most commonly performed for hemostatic purposes in cases of aneurysm and of traumatic lesions of this vessel.

Obstruction of the biliary passages is of more common occurrence in medical practice. It is encountered in biliary calculosis in certain tumors, cicatricial stenosis, certain parasitic infestations, obstructions of the endocanalicular system, calcification of the internal elastic membrane and cirrhosis of the liver.

In some pathological cases the arterial blood supply as well as the biliary passages may be obstructed, as is the case in aneurysm of the hepatic or superior mesenteric artery with pressure upon the bile ducts.

Biasini used only dogs as experimental animals, and sub-divided the various groups according to the type of intervention as follows: (1) simple ligation of the hepatic artery, (2) simple ligation of the ductus choledochus, (3) simultaneous ligation of the hepatic artery and the common duct, (4) primary ligation of the hepatic artery and secondary ligation of the common duct, and (5) primary ligation of the common duct followed by secondary ligation of the hepatic artery.

Following the operation the author studied the effects upon the individual functional components of the liver and he observed also the blood sugar, the non-protein nitrogen level of the blood, the acid-base equilibrium of the blood and the physico-chemical character of the bile.

Biasini also studied the roentgenological picture of the gall bladder following ligation of the bile ducts in dogs in which the hepatic artery was ligated; he studied the establishment of an arterial collateral circulation.

From the results obtained he concludes that ligation of the common hepatic artery is not followed by grave disturbances; compensation follows easily, and the obstruction is not incompatible with life. Contemporaneous ligation of the hepatic artery and of the biliary ducts on the other hand is rapidly followed by grave disturbances resulting in the death of the animal.

Various combined ligations usually result in permanent disturbances which are rarely compatible with life. Simple ligation of the common duct followed by secondary ligation of the hepatic artery seems to be the least dangerous procedure in this respect.

The author then analyzes the results critically and comparatively and brings them into analogy with various human pathological conditions.

He discusses the organofunctional changes resulting from the occlusion of the hepatic artery and of the common duct and emphasizes that occlusion of the hepatic artery although of a certain gravity does not cause death of the animal. Occlusion of the common duct on the other hand calls for immediate surgical intervention if all the indications are present.

RICHARD F. SOMMA, M.D.

Ravdin I S, Rhoads J E, Frazier W D and Ulin A W. The Effect of Recent Advances in Biliary Physiology on the Mortality Following Operation for Common Duct Obstruction. *Surgery* 1933, 3: 805.

In the period between 1922 and 1933, 14 patients with obstructive jaundice were operated upon at the Hospital of the University of Pennsylvania. These cases were analyzed for the effect of a changing pre-operative and postoperative régime on morbidity and mortality. The series was divided into three groups. The differences in pre-operative and postoperative treatment in these groups are summarized in the following table.

VARIATIONS IN PRE-OPERATIVE AND POSTOPERATIVE THERAPY

Group	I	II	III
Years	1922-1929	1929-1933	1933-1937
No. of Patients	59	47	49
High Carbohydrate Diet	0	+	++
Calcium	+	±	0
Supplementary Intravenous Glucose			
Pre-operative	±	+	++
Postoperative	±	+	++
Blood Transfusions			
Pre-operative	0	0	++
Postoperative	±	+	++
Operation during Period of Constant Bilirubinemia	0	+	+
Biliary Decompression	0	±	+
Relieving Bile	0	+	++

The incidence of pancreatic asthenia, liver shock and postoperative hemorrhage and the mortality due to these complications are tabulated in detail for each group. It appears that pancreatic asthenia and liver shock have been encountered with decreasing frequency. Postoperative hemorrhage however remains a common complication of operations upon jaundiced patients, but it has been possible to reduce the degree of the bleeding and the mortality of the complication. The operative mortality in the authors' series has been greatly reduced.

The various problems peculiar to the surgery of obstructive jaundice are discussed and the newer methods of pre-operative and postoperative treatment are evaluated. JOHN H. GARLOCK, M.D.

D'Aunoy R, Ogden M A and Halpert B. Primary Carcinoma of the Biliary System. *Surgery* 1938 3: 00.

At necropsy performed in the cases of 609 persons over one year of age, primary carcinoma of the biliary system was found in 40 cases. In 23 of these the condition had been primary in the liver (16 liver cell and 7 cylindrical cell carcinomas). In 6 it had been primary in the extrahepatic biliary ducts and

and severe malnutrition. It is therefore essential to maintain a suitable nitrogen equilibrium, which can be done only by insulinization. The author also describes the surgical interventions on the nerve supply of the pancreas intended for the relief of certain diabetic conditions.

After having discussed the historical features of diabetes mellitus resulting from hyposecretion of the islands of Langerhans, the author describes certain hypoglycemic states resulting from hyperinsulinism. This disorder was first described in 1924 by Harris, who called attention to a clinical condition characterized by extreme weakness, a tendency toward syncope, an intense hunger sensation, and hypoglycemia. Later it was found that this disturbance is primarily due to hyperactivity of the islands of Langerhans resulting from certain neoplastic changes within that tissue. Subtotal pancreatectomy is the operation of choice in this clinical syndrome.

La Barre does not recommend perivascular sympathectomies which certain investigators advocate for the improvement of diabetic conditions.

RICHARD E. SOMMA, M.D.

MISCELLANEOUS

Severi, A.. Experimental Research on Endoperitoneal Bacteriophage Therapy (*Ricerche sperimentali sulla batteriofagoterapia endoperitoneale*) *Clin. chir.*, 1938, 14: 165

Severi states that bacteriophage therapy was introduced in Italy as early as 1924 by Alessandrini and Doria in the treatment of typhoid fever. They reported good results in about 50 per cent of the cases. These investigators observed in most cases an attenuated course and a markedly shortened duration of the disease. The bacteriophage was administered orally and intravenously in these cases.

Severi used guinea pigs and rabbits as experimental animals. Into these animals he injected intraperitoneally broth cultures of staphylococcus aureus obtained from cases of osteomyelitis, bacillus coli, paratyphoid A and B, and mixed cultures. A certain number of control animals were allowed to die, another group received an intraperitoneal injection of the specific bacteriophage immediately after the bacterial inoculation. Animals injected with a mixed bacterial broth culture received a specific polyvalent bacteriophage. Into another series of animals the author injected the bacteriophage at various time intervals (up to six hours) following the broth culture inoculation.

Following the broth culture inoculation.

Besides observing the general effect of the bacteriophage, the author also studied the speed of microbic absorption from the peritoneal serosa, the behavior of the non-protein nitrogen level in the blood, and the leucocytic curve in relation to the peritoneal infection and to the bacteriophage therapy. Also the thermal elevations and the pulse were recorded.

From the results obtained, the author concludes that the action of bacteriophage introduced into the infected peritoneal cavity is quite noteworthy if the latter is administered contemporaneously with the pathogenic organism (staphylococcus pyogenes aureus, bacillus coli, or paratyphoid B). In order to obtain satisfactory results the bacteriophage must be specific for every type of organism.

The author also found that if the bacteriophage injected into the peritoneal cavity neutralizes the action of the virulent organism, examination of the blood reveals a marked leucocytosis, but the absence of such a finding indicates that the bacteriophage has failed to act.

In the presence of a well acting bacteriophage, the thermoregulatory center is stimulated and there is a marked rise in the temperature, this rise does not occur, however, in control animals or in cases in which the bacteriophage fails to overcome the virulence of the infecting organism.

Furthermore Severi found that following the bacterial inoculation, the non-protein nitrogen level in the blood was slightly raised. This phenomenon occurred in the control animals as well as in animals which were treated with the bacteriophage.

The organisms injected into the peritoneal cavity appeared in the blood stream after five minutes in control animals as well as in those treated with bacteriophage, but in the latter group the blood cultures became negative after twelve hours.

Severi also found that the bacteriophage administered even two hours after the inoculation was capable of neutralizing the action of the infecting organism, but if administered later, its effect rapidly diminished. After four hours the action of the bacteriophage ceased completely.

The author believes that bacteriophage therapy is of unquestionable value, and that this principle should be applied more frequently in human cases.

RICHARD E. SOMMA, M.D.

abdomen closed. In spite of massive exudate and innumerable fat necroses smooth recovery took place. Manipulation of the gland is dangerous as it increases necrosis within the pancreas. Cholecystectomy and drainage of the common duct do not improve the outlook. Such casual therapy should be attempted if the general condition is good and the gall bladder symptoms are predominant. The pancreas should always remain untouched. The results of all such operations are bad with a mortality of from 50 to 80 per cent. The changes in the gland progress irresistibly even with early operation. The fate of the patient is sealed the instant the disease breaks out and is not to be influenced by operative measures. If the diagnosis is uncertain exploratory operation should be done but one should proceed conservatively if pancreatic necrosis is found. The mortality with conservative treatment is at most 25 per cent. In one third of the patients who recover abscesses subsequently develop in the lesser sac beneath the diaphragm or in the pancreas itself. Prophylaxis and the prevention of recurrence consist in early radical operation of the gall bladder disease. Such disease must be suspected following an attack of pancreatic necrosis even if the previous history is not definite. If operation is not done chronic pancreatitis may develop. In patients who recover alimentary glycosuria must be watched for. Conservative treatment of acute pancreatic necrosis was also recommended by Koerte in his famous monograph. His return to his original indications seems in the light of newer investigations to be in the best interests of the patient.

(NORDMANN) LEO M. ZIMMERMAN, M.D.

Boyce F. F. and McFetridge E. M. An Experimental Study of Operations Which Involve Excision of the Pancreatic Secretion from the Intestinal Tract with Special Reference to the Possible Effects on Protein and Fat Digestion and on the Metabolism of the Liver Cell. *Surgery* 1935 4 55.

The authors report their experiments on animals in which the external pancreatic secretion was excluded from the intestinal tract by various methods.

The digestion of fat and protein was approximately normal in all the animals even when a diet unusually rich in these substances was given. In spite of this fact however fatty changes in the liver developed in the animals in which partial or complete pancreatectomy was done. However if lecithin was added to the diet of these animals fatty changes did not develop in them. Neither did fatty changes develop in animals in which the pancreatic ducts were ligated and divided but in which the pancreas was left *in situ*.

The experimental evidence outlined seems to corroborate Dragstedt's assumption of a pancreatic hormone which can take over the function hitherto assigned exclusively to the external secretion.

The clinical application of this experimental work suggests

1 That radical surgery which does not involve excision of the pancreatic tissue may safely be done without the implantation of the pancreatic ducts for malignancies of the ampullar and peripapillary regions. In such cases fatty infiltration of the liver is not likely to develop.

2 That when such surgery must include excision of the head or of the head and body of the pancreas fatty changes will develop within the liver unless lecithin, choline, pancreatic substance or alcoholic extracts of the pancreas be administered to forestall them.

SAMUEL KARY, M.D.

La Barre J. Experimental Pancreatectomy (La pancréatectomie expérimentale). *J. internat. de chir.* 1935 3 277.

La Barre states that partial or total removal of the pancreas has been an important operation performed on animals to study the rôle played by this organ in the regulation of the blood sugar and in the elaboration of its digestive enzymes. Partial pancreatectomy has also been found to be a useful operation in certain hypoglycemic states due to the overproduction of insulin by a hyperplastic or neoplastic pancreas.

After having described some of the original methods of depancreatization in the dog the author briefly reviews the anatomical features of this gland and outlines the methods of its partial or total removal. After the animal has been suitably anesthetized the abdominal cavity is exposed the tail of the pancreas is liberated the gastrosplenic portion is extirpated and the head is separated from the duodenum care being taken that the pancreaticoduodenal artery which supplies this portion of the intestine is not injured. Any residual portion of the gland is removed by curettage.

Depancreatized dogs invariably develop diabetes which is usually combated by the daily administration of from 6 to 8 units of insulin beginning on the second day after the operation. In order to offset the digestive disturbances resulting from the absence of the pancreatic enzymes the animal is given 200 gm. of raw pancreas two or three times a week. Concerning the partial removal of the gland Minkowski has shown that definite symptoms of diabetes appear if one fifteenth of the total pancreatic tissue is left *in situ*. In general the degree of severity of the diabetes depends upon the quantity of pancreatic tissue which has been removed.

La Barre furthermore discusses the biochemical changes which follow partial or total pancreatectomy such as hyperglycemia, glycosuria, acidosis and uremia. In this connection the author points out that glycosuria is primarily conditioned by a renal factor and that this symptom therefore should never be considered a basis for estimating the severity of the hyperglycemia. He also points out that in diabetes the nitrogen metabolism is profoundly disturbed as can be observed from the greatly increased nitrogen elimination. This disturbance is most frequently accompanied by acidosis.

of the usual syndrome is "pyelitis of pregnancy." This evokes less criticism but, like others, it is inaccurate in that it does not completely indicate the structures involved in the pathological process. In addition, it indicates that it is peculiar to pregnancy, which is not true, for we have the same disease process in children and in non-pregnant women.

Kamniker (142) writes of "pyelitis gravidarum" and gives the following definition. "an inflammation of the renal pelvis in which, in most instances, the parenchyma is more or less involved, less often, the ureter, and least often, the bladder." This definition has the merit of clarity, but expresses belief in parenchymal involvement of the kidney as a common event, a belief which most observers do not share because the results of such involvement are not clinically demonstrable, either during the febrile phase or later, with rare exceptions.

Wear (317) gives the following definition: "Pyelitis is non-suppurative pyelonephritis," a very confusing statement because the terms used in the definition are themselves indefinite. Other terms frequently found are: "pyelitis colibacillaire" and "pyelocystitis" or "cysto-pyelonephritis gravidique." Enough has been said to indicate not only the variety of terms that have been coined to identify the disease, but also to point out the confusion that exists as to the structures usually involved. It is obvious that a simple, accurate system of nomenclature is urgently needed, hence we propose the one outlined, which uses a simple anatomicopathological basis.

The characteristics of pyelo-ureteritis, its common variations, and complications, together with the structures involved, will be systematically presented. However, inasmuch as many of the variations, as well as the incidence and sequelæ, are dependent upon the altered anatomy and physiology of the urinary tract characteristic of pregnancy, the latter should be considered first.

ANATOMICAL CHANGES IN THE URINARY TRACT

In the non-pregnant woman the urinary bladder lies rather low in the pelvis and its posterior surface is in direct approximation to the uterus and vagina. These latter organs give the base of the bladder its anterior convexity and, at the same time, produce slight depressions at either end of the interureteral ridge in which the ureteral orifices lie. This relationship of the base of the bladder to the uterus and vagina is significant because of the marked changes which pregnancy and parturition produce in the birth canal. Were it not for the loose areolar connective tissue unit-

ing the bladder to the uterus, the former would, of course, be stretched excessively during labor; however, this relationship provides the necessary freedom of movement.

With the advent of pregnancy the texture of the uniting connective tissue becomes even more flexible. The trigone, or that portion of the base of the bladder lying between the ureteral orifices and the internal urethra, is much more intimately adherent to the vagina, so that it does not accommodate itself as adequately as other portions of the bladder to the enlargement of the uterus, and more particularly to the passage of the fetal head, with the result that overstretching, occasional tear of muscular elements, and edema are common in this physiologically important portion of the bladder.

Previous to the fourth month of pregnancy few significant changes take place in the bladder, whereas from the fourth month to term marked alterations occur. With the increase in size of the uterus, the bladder is carried upward so that when distended with urine it leaves the pelvis and becomes an abdominal organ. The generalized hyperemia characteristic of all pelvic organs in pregnancy is shared by the bladder and ureters to such a degree that there is marked increase in the caliber and tortuosity of all blood vessels, particularly toward term.

With the descent of the fetus into the pelvic cavity, the base of the bladder is further curved anteriorly by the pressure of the presenting part, which tends to produce passive congestion and edema of the tissues, which in turn make these tissues increasingly vulnerable to trauma and infection. The existence of these factors, and the close relationship of the trigone to the vagina, explain the background for the common bladder difficulties, such as incontinence, retention of residual urine, inability to void, and cystocele, often seen in the post-partum period.

The upper urinary tract, that is, the ureters, kidney pelves, and calyces, also undergoes an important series of changes characteristic of pregnancy. With the implantation of the ovum, a process of hypertrophy (Kuestner, 158 and Loeffler, 181) is initiated in all these structures, similar to that occurring in the genital tract, whereby, as pregnancy progresses, the walls thicken, particularly in the muscular and areolar connective-tissue portions, so that by term a definite increase is uniformly demonstrable (Hofbauer, 123, Mengert, 199). The ureter, particularly, responds in this way and, in addition, becomes elongated, tortuous, and possessed of a markedly increased lumen, so that it normally

INFLAMMATION OF THE UPPER URINARY TRACT COMPLICATING THE REPRODUCTIVE PERIOD OF WOMAN

Collective Review

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DURING the course of the past few years extensive experimental and clinical studies have yielded much valuable information in regard to the physiology of urinary elimination in normal pregnant and non pregnant women and to the etiological relationship this bears to the inflammatory processes which often complicate the gravid state. In addition new concepts of the syndrome commonly known as pyelitis of pregnancy have evolved and several advances in treatment have been made.

A critical review of this voluminous work, a large part of which is not readily accessible to the obstetrician, seems desirable for the purpose of familiarizing him with the literature and enabling him to utilize the information it contains. The multiplicity of these reports and investigations has resulted inevitably in some differences of opinion as to the factors responsible for the increased incidence of inflammation of the urinary tract in pregnancy as well as to the best methods for therapeutic relief. However it is possible to trace a gradual but definite consolidation of experience with the result that today we, as clinicians, are more able than ever before to treat the disease effectually.

In making this survey it has been necessary to exercise a considerable degree of discrimination in order that its length might be kept within reasonable limits. For this reason although the literature has been thoroughly scrutinized many reports of a confirmatory nature have been deleted. Even so it has seemed necessary to quote the 330 references cited in the appended bibliography. As will be seen most of these are in the German, British, American, French and Italian journals. All have been read in their original form and the significant facts consolidated into this résumé. Extensive reviews attempting the same objective have appeared in the literature of other countries. Those worthy

of particular mention are those of Contades (36-44), Baird (7-11), De Beaufond (65), Hank (107), and Bompiani (24).

The title appearing at the head of this review was chosen after much consideration because there was found to be such a diversity of nomenclature applied to inflammation of the urinary tract in general and even to the relatively well recognized syndrome encountered in pregnancy as to make the choice of any of the common appellations not only difficult but certain to lead to misconception.

DEFINITIONS

In an attempt to bring some degree of consistency into the prevailing confusion and inaccuracies of terminology we shall use a simple anatomicopathological system of nomenclature not only because it is already in use in some quarters and is readily understood, but also because it is more accurately descriptive and can be applied to the male as well as to the pregnant or non pregnant female.

Inflammations of the tissues of the urinary bladder will be termed cystitis; those of the ureter ureteritis; of the renal pelvis pyelitis and those of the renal parenchyma nephritis. Inasmuch as the commonest involvement of the urinary tract in pregnancy, usually called 'pyelitis of pregnancy' embraces primarily the renal pelvis and ureter one may properly according to this system term the syndrome pyelo-ureteritis of pregnancy and when as sometimes happens, the process extends to the renal parenchyma one should speak of pyelonephritis or more accurately pyelo-ureteronephritis. However the latter is cumbersome and may be safely contracted to pyelonephritis. Nevertheless to speak clinically of pyelonephritis of pregnancy as the common complication of pregnancy as is done frequently in France and sometimes in this country is misleading because demonstrable involvement of the renal cortex is seen only infrequently. The term in most common use to convey the concept

of study in the past, the tract between the foramina papillaria and the ureterovesical valves has only recently had intensive study devoted to it. The intrinsic motility of smooth muscle in general is well known, and as the renal calyces and pelves and the ureters are supplied with coats of smooth muscle, the tract was from the first supposed to be possessed of peristaltic activity. DuBois-Reymond (80) was one of the earlier investigators who studied the mode of urine propulsion by the ureter, and as a result of his studies came to the conclusion that the origin of the contractile impulse was at the ureteropelvic junction, or possibly in the renal pelvis itself. Jona (139), Fuchs (93), and others have confirmed the principle that in the musculature of the kidney pelvis lies the pacemaker for the peristaltic activity of the tract. Jona (139) has very clearly shown the systematic and propulsive action of contractions of the renal calyces which force urine into the pelvis of the kidney and are then followed by contraction of the pelvic musculature, while the calyces are still in systole, the combined effect of which is to force urine into the relaxed upper portion of the ureter. Fuchs (93) has studied the ureteral action and describes the formation of cystoids in the ureter, which receive urine from above and then force it onward by a detrusor action of the ureteral musculature. Three principal zones for this type of cystoid-detrusor activity are described by Fuchs: two in the abdominal spindle of the ureter, and one in the pelvic portion. DuBois-Reymond (80) has also theorized as to the nature of the stimulus which incites contraction, and postulated three possibilities: (1) true mechanical stimuli such as would be provided by the bulk of the secreted urine, (2) the agency of the autonomic nervous system, and (3) a harmonic impulse. He concluded that the secretory pressure of the kidney could easily provide the mechanical stimulus, and came to the conclusion that this was most probably the correct explanation.

In short, the renal calyces, the renal pelvis, and the ureter have been shown to constitute a type of pump which forces the products of the kidney into the urinary bladder for storage.

This mechanism for building up pressure is a most necessary one, for it has been demonstrated by Kreutzmann (157) and Wuellenweber (327, 328) that fluid pressures are normally higher in the semi-filled bladder than in the renal pelvis, that the kidney is not, therefore, drained by gravity, and that the pelvi-ureteral musculature is a necessary provision for evacuation of the chambers of the kidney. The average pressure in the renal pelvis is 80 mm of water, whereas the

average pressure in the partially filled bladder is 90 mm of water in the non-pregnant female, which findings indicate that there is a constant head of pressure in the bladder against which the ureter must work.

Creevy (59) has very ably summarized the evidence concerning intrapelvic, intra-ureteral and intracystic urinary pressures in the normal non-gravid individual, and states that the intravesical tension is uniformly higher than the pressure in the renal pelvis, and that the greater pressures attained in the bladder and lower ureter are the result of the forces exerted by the renal pelvis and ureter combined. This relationship requires some provision to protect the kidney against these pressures. A fourfold mechanism exists for this purpose: (1) the ureterovesical valve, (2) the oblique course of the ureter through the bladder wall, (3) the peristaltic activity of the ureter (this being the most important of all, for Creevy has demonstrated that a short segment of the ureter is capable of exerting a pressure of 90 mm of water), and (4) an autonomic bladder reflex which stops ureteral peristalsis during periods of sudden intravesical tension (Boeminghaus, 21).

Further, Kreutzmann (157) and Wuellenweber (328) have established that during pregnancy not only is this pressure relationship reversed, but that considerably higher pressures are the rule in the renal pelvis, thus they found the average intrapelvic pressure during pregnancy to be 240 mm of water, whereas that in the urinary bladder falls to an average of 70 mm of water. Logically they conclude that the pelvi-ureteral pump is decompensated by some factor characteristic of pregnancy, and that to a great extent urinary evacuation in the tract becomes a function of higher pressures resulting from the secretory activity of the renal parenchyma. As DuBois-Reymond (80) and Andler (3) have shown the kidney to be capable of exerting secretory pressures on the average of 50 mm of mercury or 680 mm of water, this is a very possible function for the kidney to assume. In other words, it is supposed that the kidney cortex, by virtue of its secretory pressures, forces urine through the atonic urinary tract into the bladder where it is stored.

However, these elevated pressures are associated in all probability with side-effects. It seems likely that the dilatation of the kidney pelvis and ureter may be an expression of them, on the one hand and, on the other, since it is well known that increased secretory pressures in the kidney are only possible as a result of an elevation in blood pressure, it may well be that decompensa-

accommodates a greatly increased and, hence, a more static column of urinary fluid. This change in the ureter is seen in over 80 per cent of all pregnant women, and is so striking as to be termed the "physiological hydro-ureter of pregnancy." Baird (10) found dilatation of the tract most common on the right side—69 per cent in primigravidas, and only 25 per cent in multiparae while Kretschmer, Heaney, and Ockuly (156) made the following detailed observations concerning dilatation of the tract in 54 normal pregnant women who were studied radiographically.

TABLE I—DILATATION OF URETER IN PREGNANCY

FIRST PERIOD SECOND TO FIFTH MONTHS		Lumbar Ureter		Pelvic Ureter	
		Calyces	Pelvis		
Percentage on right side	52	54	52	17	
Percentage on left side	15	18	35	34	
SECOND PERIOD SIXTH TO NINTH MONTHS		Lumbar Ureter		Pelvic Ureter	
		Calyces	Pelvis		
Percentage on right side	92	80	74	0	
Percentage on left side	30	30	53.9	0	

Somewhat to the contrary, Schumacher (265), who studied 100 normal pregnant women using intravenous pyelography and stereoscopic technique in the roentgenograms, found little or no change in the first four months, whereas, in the fifth and sixth months there was definite dilatation in the abdominal ureter measurable in 51 per cent and in the seventh and eighth months, dilatation was marked in 80 per cent. In addition he noted a marked lateral displacement of the abdominal ureter and posterior displacement of the pelvic ureter, with no dilatation of the latter at any time.

Usually the normal ureter and kidney pelvis will accommodate from 0 to 15 ccm of fluid, but as Crabtree (54) has observed from his measurements, this cubic capacity may be increased from 20 to 60 ccm as a result of the changes normally incident to pregnancy. Only 15 per cent of pregnant women, according to the opinion of the majority of observers, may be said not to develop this increased capacity for retaining urinary fluid.

As a result therefore of these and many confirmatory studies we know that the upper urinary tract—that is, the ureter from the pelvic brim upward—together with the renal pelvis and the calyces undergoes a process of hypertrophy and dilatation in the majority of normally pregnant women, and that this change is much more frequent and more marked upon the right side than it is upon the left and, furthermore, that no similar alteration is seen in the pelvic portion of

the ureter below the lower extremity of the psoas muscle. This increased size is associated with an increase in the fluid-containing capacity, of from two to six times the capacity observed in the tract of the normal non-gravid woman. In other words, there is a partial stagnation of urine or a physiological hydro-ureter.

The reason for the greater dilatation upon the right side as compared to the left seems best explained upon a mechanical basis. Bachrach (6) Francke (87), and Heckenbach (11) as well as Baird (11) and others have shown that pelvic tumors, tumors of the liver, gall bladder, and pancreas, and pelvic inflammatory disease can by the pressure they exert upon the ureter, bring about a certain degree of unilateral ureteral dilatation in some ways similar to that seen in pregnancy, the dilatation disappearing when these abnormalities are satisfactorily removed. Many have thought the fetal presenting part was responsible for the mechanical obstruction; however, this thesis has been effectively disproved. Halban seems to have been the first who suggested that the common dextro-rotation of the uterus provided more complete occlusion of the right ureter than of the left and that this, at least in part, accounted for the more frequent and more marked enlargement upon the right side. Others, Baker and Lewis (12) have emphasized the protective influence of the sigmoid colon at the pelvic brim on the left as being effective in preventing the pressure of the enlarged uterus upon the left ureteral tract. The consensus of opinion seems to be that the pressure of the pregnant uterus together with its dextro-torsion are the mechanical factors which tend to cause dilatation of the ureters above the pelvic brim. However, it is also accepted that there are additional influences at work, other wise one cannot explain dilatation commencing at the fourth month when the uterus is too small to obturate the pelvic inlet, on the one hand, and on the other the mechanical pressure theory does not explain the confirmed observation that the ureters decrease in size during the last month of pregnancy when presumably the uterus because of its size is capable of exerting its greatest occlusive effect. This additional factor is to be explained by a consideration of the physiological variations of the ureter and kidney pelvis in pregnancy.

THE PHYSIOLOGY OF THE UPPER URINARY TRACT

Whereas the physiology of the renal cortex and that of the bladder have received a vast amount

of the ureter. Other workers, particularly Villaret (312, 313), Grossv-Streja (104), and Rossi (252), have performed experiments of various sorts, all tending toward the same conclusions. Philipp (229) has shown that he can bring about dilatation of the non-pregnant woman's ureters very promptly by giving the woman a transfusion with blood from a pregnant donor. He cites his experience in this regard as proof of the hormonal nature of the reactive substance, and states as his belief that the hormones originate in the placenta.

Thus, we have arrived at the conclusion that the physiological propulsion of urine by the urinary tract is very markedly altered during pregnancy, sometimes to the point of complete decompensation, and also that the factors responsible for this alteration are principally chemical in nature, in all probability those essential or intimately concerned with the successful outcome of the gestational function of woman. That mechanical factors, such as torsion of the uterus and pressure of the enlarged uterus upon the tracts, also play a part, no one can doubt, however, the underlying atony seems, in the light of present information, to be the most fundamental cause

PYELO-URETERITIS

As we have seen, urinary stasis of greater or lesser degree is the usual accompaniment of pregnancy. Therefore, the relatively higher incidence of upper urinary-tract infection in pregnant women than in any other clinical group, excepting perhaps young female children, is easily understood, for the only additional factor necessary to produce the disease syndrome, pyelo-ureteritis, is the introduction of considerable numbers of colon organisms into the upper portions of the tract (Kamniker, 146).

MICRO-ORGANISMS CAUSING INFECTION

All observers agree that bacilli of the colon group of organisms are the chief pathogenic agents producing the inflammatory lesions of the upper urinary tract (80 per cent, Kehrer, 147), although Cathala (31), in 1904, pointed out that the colon organisms having produced an inflammation might, and occasionally did, prepare the way for the other organisms, or secondary invaders, to enter the field, and that when this occurred, the mixed infection resulting not only was more resistant to treatment but also was more apt to develop serious complications.

An analysis of the investigative work along bacteriological lines is fraught with many difficulties because of the different technical methods

used, on the one hand (Hundley, 130), and, on the other, because many observers use the total number of positive cultures obtained in reporting their results instead of differentiating between pathogens and non-pathogens, as well as fail to exclude obvious contaminants such as those which are found normally to inhabit the skin surfaces. There are, therefore, wide discrepancies between the findings of different workers.

A statement which is often made is to the effect that the normal kidney can excrete micro-organisms with no impairment to itself or the other urinary organs, and that this so frequently occurs in the pregnant woman that there is a high incidence of bacteriuria (De Beaufond, 67). The earlier observers, such as Albeck (1), and Duncan and Seng (82), found micro-organisms in 50 per cent and 11 per cent, respectively, in the upper urinary tract of normal pregnant women. Such a finding would tend to verify the point of view as given above. However, more recently, McLane and Traut (198), using very careful technique and relatively large quantities of inoculum, recovered only 0.86 per cent of pathogenic bacteria (coliform organisms) from the ureteral urine and 12.0 per cent of all forms of micro-organisms in a group of 30 normal pregnant women, whom they followed with repeated catheterizations throughout pregnancy. Hundley, Siegel, Hatchel, and Dummer (130), using much the same technique with a group of 50 normal pregnant women, also found a low incidence, they obtained positive cultures for coliform organisms from the upper tract in 6 per cent, and from the bladder urine in 9 per cent. This would tend to show that the older view is not necessarily correct and that when a high incidence of the coliform organisms is found, there is in all probability some pathological condition present in the tract, or the organisms are being excreted by the kidney because of abnormalities in other organs, most probably the intestine, as has been emphasized by Kretschmer (153).

The only recent study of bladder urine in which the different types of coliform bacilli were differentiated as to incidence is that of Harris and Herrmann (108), in which they found the following distribution in normal women:

TABLE II — TYPES OF COLIFORM BACILLI

	Antepartum Per cent	Postpartum Per cent
<i>Escherichia coli</i>	6	5.3
<i>Escherichia communior</i>	2.7	6.0
<i>Alcaligenes fecalis</i>	4.0	3.3
<i>Proteus</i>	0	0
<i>Staphylococcus albus</i>	8	13.3

It is safe to say that the majority of normal pregnant women may excrete small numbers of

tion of the musculature of the urinary tract is the explanation of some of the hypertensive phenomena of pregnancy. This latter possibility has been suggested by Hayes (110), Baird (8), Eufinger (83), and others.

URETERAL ATONY IN PREGNANCY

For nearly a hundred years it has been known that dilatation of the ureteral tracts is common in pregnancy, but not until the past twenty-five years has it been realized that mechanical obstacles, such as the enlarged uterus and torsion, did not suffice to account for this phenomenon. Storckel (488), Weibel (318), and Kaltenschnee (141) all realized that an atony of the musculature must also exist. These and various other reporters assigned bacterial toxins, overdistention of the musculature changes in the calcium and potassium ions in the urine, altered neuromuscular mechanism and a variety of other factors as the causes of the atony.

That atony did exist was strongly suggested by the work of Kaltenschnee (141), Gremme (101), Pflaumer (237), Baird (8), Bolhuis (23), Mandruzzato (189), Paladini (215), Rao (142), Seitz (271), Sellheim (272), and Sorrentino (279) to name only a few. However the proof of its existence and incidence in relation to the various months of pregnancy, as well as its exact relation ship to dilatation of the ureter, was not available until recently when Traut and McLane (302) showed conclusively that dilatation of the tract as measured by pyelograms is inversely proportional to the degree of atony as expressed by kymographic tracings. We now know that the decompensation of the pyelo ureteral mechanism is due to an altered irritability of the musculature and that it is a concomitant of normal pregnancy.

Much work has been done to explain why the ureteral musculature should undergo these atonic phases. Loeffler (181) in an attempt to explain all on a mechanical basis, postulated first an increasing degree of obstruction to the ureter due to the increasing size of the uterus. This obstruction he thought causes the ureter to undergo hypertrophy of its muscular elements in an attempt to compensate for the increased effort necessary to evacuate the tract. Ultimately in the majority of women, he argued this period of compensation passes into one of decompensation with associated dilatation of the ureter and kidney pelvis, and is associated inevitably with atrophy of the musculature and stagnation of the urinary stream.

That this explanation cannot be adequate has been apparent to many workers, for as Traut

and McLane (302) proved, and many others had previously intimated, the ureteral musculature re-establishes intrinsic muscular activity on an increasing scale from the seventh month of pregnancy onward to term, which would seem wholly impossible were not other factors than simple mechanical obstruction at work.

The parallelism between the atony of the ureteral musculature and that inherent in the uterus impressed many observers. Inasmuch as the uterine atony was thought to be due primarily to hormonal influences it seemed logical to suppose that the atony of the ureter might also be due to chemical influences characteristic of pregnancy. Kidd, in 1920, was probably the first to actually enunciate this idea (Burrows, 27). Hofbauer (122), realizing that a number of smooth muscular structures, such as the colon and gall bladder, were known to be sluggish in their activity in pregnancy studied the problem from the point of view of the possible influence of increased bile salts. By studying segments of ureter *in vitro* he felt that he established the observation that increased bile acids circulating in the media of his experiment brought about a decrease in muscular contractibility of the organ.

Bompiani (24) studying the action of the so-called "pregnancy hormones" upon the isolated ureter kept alive *in vitro*, came to other rather startling conclusions. He felt that undoubtedly the urine of the pregnant woman contains substances capable of altering the functional activity of the isolated ureter kept alive *in vitro*, and that this action can be explained only by the effect of these substances upon the circular and longitudinal fibers of the ureter. He found that they altered the energy, rhythm of contractions, and the tone and so modified the peristalsis or coordinated expression of these factors. The action of these substances eliminated through the renal cortex of the pregnant woman was supposed to affect the motility of the ureter by activating it in the early months and then inhibiting it during the second half of pregnancy. Furthermore in a series of brilliant experiments Bompiani was able to demonstrate that these inhibitory effects were obtained most markedly by the use of corpus luteum extracts and least markedly from follicular liquid obtained directly from follicular cysts of the ovary.

Contades (36-40) using a similar technique showed that the ureter *in vitro* was rendered much less active by follicular corpus-luteum extract and amniotic fluid as well as that the untreated urine of pregnant women in the sixth and seventh months definitely depressed the muscular activity

- b Marked infection and infiltration of the ostium
- c In neoplastic infiltrations of the orifice
- d. Sometimes in spinal diseases
- 3 In some congenital defects
 - a. Defects of the ureteral wall
 - b Congenital atony
 - c Megalo-ureter

Schumacher (267) attempted to demonstrate reflux in 100 normal and "pyelitic" women, and was unable to prove a single instance. Bumpus demonstrated only 89 instances of reflux in 1,036 cystograms, and concluded that reflux was never found in the normal bladder except in children. Morris and Brunton (210) examined 104 pregnant women in the last trimester of pregnancy and demonstrated it upon 2 occasions. Frommolt (90) studied many women, some of whom were normal, others with toxemia, and many with pyelo-ureteritis, and was unable to demonstrate the slightest reflux. On the other hand, Griepkoven (103) states dogmatically, but without adequate proof, that "reflux may be produced frequently in pregnancy when the urinary tract is normal."

Legueu and Fisch (169), Sennewald (275), Mikulicz-Radecki (203), and Devraigne and Petit (74), to name only a few, support the hematogenous theory of the origin of the disease. These writers represent the weight of opinion which is based chiefly upon clinical evidence and theoretical considerations. Against their point of view one must place the common experience of all who have made cultures from the blood of patients suffering from pyelo-ureteritis, which indicates that it is extremely rare, even in the height of a chill, that one is able to recover any type of micro-organism from the circulating blood (Devraigne and Petit, 74). In addition, Helmholtz (114) has demonstrated in rabbits that when colon bacilli in massive dosage are injected into the vein, suppurative lesions localized in the kidney substance, the papilla, and the adjacent lining of the renal pelvis are the result, whereas, when the organisms are injected without trauma into the bladder, peripelvic and peri-ureteral inflammation result. Helmholtz's experiments would seem to indicate that the vascular route is relatively rare in human subjects, because demonstrable cortical lesions in pyelo-ureteritis are rare and are seen only occasionally in patients who have developed pyelonephritis following pyelo-ureteritis.

In short, the assumption that the infection in pyelo-ureteritis of pregnancy usually travels by

way of the blood stream is unsupportable because the distribution of pathological lesions is not that which would occur were this the common means of dissemination of the colon organisms.

Weibel (318), Grandjean (100), Walther (316), Holmes (127), Kincaid (149), and Gibberd (97) are among those who choose to interpret their observations of the pyelo-ureteritis syndrome as being the result of the lymphatic spread of micro-organisms. They point out that it can explain (a) the "ascending type" of infection from the birth canal, bladder, and urethra, (b) the descending type, probably originating from the bowel, as well as, (c) the occasional invasion of the blood stream because of the relationship of the thoracic duct to the large veins. Furthermore, the distribution of the inflammatory lesions seems to be consistent with this means of dissemination. The experimental proof of the theory is not conclusive, however, and consists principally of the demonstration of lymphatic pathways which could afford access to foci consistent with the pathological observations. Francke (86) demonstrated the relationship of lymphatics passing from the ascending colon to the capsule of the right kidney, while Stahr has shown that lymphatics of the capsule communicate with deep lymph channels of the kidney. Winsbury-White (323) has outlined the relationship of the lymphatic drainage of the pelvic organs to those of the upper ureter, kidney, and thoracic duct. Theoretically, these two general routes can explain both the ascending and descending types of infection, as well as involvement of the blood stream. In the present state of our information, the lymphogenous theory, therefore, seems the most satisfactory one.

RELATIONSHIP OF INTESTINAL STASIS

Many writers have been impressed with the co-existence of intestinal stasis and pyelo-ureteritis. Sellheim (272) points out that normal pregnancy is associated with a loss of tonus in nearly all smooth muscle structures, and many others have called attention to the relative obstipation of the intestine and, particularly, the large bowel. Among those who believe that this may have an important etiological bearing upon inflammatory states of the upper urinary tract we should mention Kretschmer (153), LeLorier (171), Philipp (229), Schuckele (259), Sennewald (275), Stoeckel (286), and Vignes (311). It is thought that perhaps stasis of the bowel may promote the passage of colon organisms into the lymphatics or the blood stream, and from there these organisms are transferred to the urinary tract.

coliform organisms during pregnancy, and a small percentage may excrete them in fairly large numbers when there is some abnormality which permits their escape from the bowel into the tissue spaces of the body; therefore the evacuation of organisms is accomplished without the accompaniment of any demonstrable inflammatory reaction. This is hard to accept without reservations. It would seem that there must be some observable response to a potentially pathogenic organism such as the bacillus coli when it reaches the lymph blood or tissue spaces, even though in small numbers. However, if there is a reaction it is undetectable clinically, so that from the clinical point of view the first statement must hold until further data are available.

The factors that determine which patient is to develop the inflammatory reaction are only partially known. Dresel has shown that those who respond to the invasion by developing the clinical syndrome of pyelo-ureteritis have an opsonic index which is uniformly lower than that observed in the control groups.

Although stasis of urine in the dilated ureter and kidney pelvis is generally conceded to be the greatest single factor, no one has shown a definite correlation between the severity of the clinical manifestation and the degree of stasis in the urinary tract. On the contrary some of the severest infections show only slight stasis and the converse is also occasionally true; however one rarely sees a pregnant patient with definite clinical pyelo-ureteritis and no demonstrable dilatation of the tract (Kammiker 143).

Thus far the only study which has been reported in which a systematic attempt has been made to correlate the clinical picture with the type of organism involved is that of Baird (7). It is well known that there are marked differences in the pathogenicity of the various members of the colon family, so that information of this sort is needed. Baird's findings are as follows:

TABLE III—TYPE OF INFECTING ORGANISM

Severity of illness	1	2	3	4	5	6
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Very acute	10-20	0-25	7-20	8-42	3-14	1-10
Moderate	10	12	8	7	4	5
Slight	8	15	20	4	5	4

Bacillus of *E. coli* group 1
 2 *B. coli* lactis
 3 *B. coli* communis
 4 *Bacillus aerogenes*
 5 *Bacillus coli aerogenes*
 6 *Paracolon* group

Bacillus proteus is known to be a difficult organism to eradicate by any form of treatment as it requires an acid urine because of its ability to split urea into ammonia which tends to alkalinize

the urine (Lyon 185). As stated before it is recognized that when the inflammation is complicated by "secondary invaders" the course of the disease is more complex. Yet no one has thus far indicated what these "secondary invaders" are, excepting that they are usually streptococci, to say nothing of proposing logical means for combating them.

There is therefore urgent need for more specific bacteriological study of the micro-organisms in relation to the clinical forms of the disease.

MODE BY WHICH MICRO-ORGANISMS INVADE THE URINARY TRACT

There is marked divergence of opinion as to the route by which micro-organisms reach the kidney pelvis. However there is general agreement that access must be attained by one of three ways: (1) reflux from the bladder into the ureter and thence by antiperistalsis to the kidney pelvis; (2) by means of the blood stream, being excreted through the glomerular tuft of vessels into the capsule of Bowman and then washed in the urine through the proximal convolutions loop of Henle the distal convolutions and finally the collecting duct to the foramen papillarium; and (3) by means of the lymph stream from the ascending colon to the capsule of the right kidney, then by way of the deep lymphatics of the capsule into the parenchyma, or by means of the lymphatics from the vagina and cervix, urethra and bladder upward along the course of the ureter into the renal pelvis as well as the thoracic duct.

The oldest and simplest view is that involving reflux and antiperistalsis. Antiperistalsis has been shown by Wislocki and O'Connor (324) to occur in experimental animals while Jones (137) and Trautner (204) have shown that it can occur under certain abnormal conditions in the human ureter. On the other hand the consensus of opinion which has grown very weighty indicates that reflux never occurs normally in the human being and is seen only under very special pathological conditions.

Blum (18) goes so far as to state that in the human being ureterovesical reflux can occur only under the following conditions:

1. In normal ureters and bladders
 - a. In childhood
 - b. Under narcosis
 - c. During ureteral catheterization
 - d. Following nephrectomy
2. In the presence of injured ureterovesical valves
 - a. When there is pathological enlargement of the ureteral ostium

Glasgow Royal Infirmary (Baird)	14 to 160
New York (Pugh)	100
San Francisco (Emge)	70
Greifswald (Philipp)	35
Montreal (Seng)	30
Vienna (Latzko) (Lepoutre)	70
Amsterdam (Van Rooy)	08

Antepartum infections are much more common than puerperal infections. Philipp (229) found only 5.8 per cent occurring in the puerperium, Prather (234), 0.4 per cent; Freudenberg (88), 11 per cent; and Dodds (75), 32 per cent.

In the antenatal period, the second semester is the period of predilection for the onset of an initial attack. Pyelo-ureteritis occurring in the first few months of pregnancy is usually the sequel of an earlier infection.

Freudenberg (88), as well as Duncan and Seng (81), found that multiparity predisposed toward a higher incidence of the disease, while Lepoutre (175), Kretschmer (153), and most of the other writers agreed that if the increased number of pregnancies in multiparas, and hence the increased opportunities for the development of the infection, be taken into account, it will be found that the chances of infection are much greater in primigravidas than in multigravidas.

The great majority of infections are unilateral and occur on the right side. Freudenberg's (88) statistics may be taken as typical. He reports 39 per cent right-sided infections, 9.2 per cent left-sided, and 52 per cent bilateral.

DIAGNOSIS OF PYELO-URETERITIS AND ITS COMPLICATIONS

In the writings upon pyelo-ureteritis complicating pregnancy too much emphasis has quite naturally been placed upon the acute or febrile phase of the disease, because it is so much more obvious and can be diagnosed frequently without the aid of laboratory or other special procedures, with the result that the chronic or afebrile phase has been neglected. Not only this, but the term "pyelitis of pregnancy" has come to mean to most clinicians only the acute phase, with the natural result that they are inclined to consider the patient cured when she becomes afebrile, and realize little or nothing concerning the chronic aspects of the disease. More must be known of the chronic phase (Guéniot, 105), which is more difficult of diagnosis, if further progress is to be made in treating the disease in pregnancy.

The difficulties which surround the diagnosis of infections of the upper urinary tract, particularly those complicating pregnancy, can only be clarified by the use of the cystoscope, the ureteral

catheter, and bacteriological studies of urine secured by these means (Philipp, 229). The bacterial content of bladder urine may be most misleading, particularly in the pregnant woman, even though the urine specimen be obtained by catheterization of the bladder (Harris and Herrmann, 108). The diagnosis can be clinched only by studies made upon the ureteral urine. Here, clumped pus cells and the demonstration of bacteria in the urinary sediment, plus cultural methods showing pathogenic organisms, particularly of the colon family, indicate infection and inflammation. If, in addition, the clinical picture of pyelo-ureteritis, namely, hectic fever, tenderness in the costovertebral angle, nausea or vomiting, and anemia, be observed, one has the complete picture of the febrile phase of the disease. However, the afebrile phases, which are even more common, are surrounded with such difficulties that only by urological methods can one arrive at the diagnosis. According to Crabtree and most other students of the disease, it is *seldom possible to cure the patient of the infection during pregnancy*. The most that can be accomplished is to keep it quiescent and the patient afebrile, unless the newer antiseptics, such as sulfanilamide, lend the much needed aid. For the present, the statement should stand as written. This is an important concept, for it usually means that the pathological processes, that is, fibrosis and inflammation, continue until after the uterus is emptied and adequate drainage and the normal motility of the tract are established.

It is, therefore, necessary not only to make a diagnosis but also to evaluate the extent of the processes and their character. The stigma of previous attacks of pyelo-ureteritis should lead one to expect greater difficulty in treating a patient in a recurrent attack during pregnancy, and definitely offers a less optimistic prognosis as to the outcome. Hence, it is important that differential kidney function tests be made so that, if renal excretion be low because of previous disease, one can know which kidney is most compromised and to what extent. A test of the kidney function by means of the intravenous pyelogram, as advocated by Schumacher (268), has proved of great value in pregnancy, for delayed excretion of the opaque substance is usually due to kidney damage. Further, the pyelogram is also of value in yielding information as to deformities of the tract.

If the inflammatory process is unilateral with good kidney excretion on the opposite side, the prognosis is good and the patient may be treated palliatively. On the other hand, if the infection is

RELATIONSHIP OF PREVIOUS URINARY INFECTIONS IN CHILDHOOD, IN THE ADULT, AND FOLLOWING MASTURBATION COHABITATION, AND DEFLORATION

Helmholz and other pediatricians have suggested that pyelitis in childhood may remain latent over long periods of time to recur in adult life (Lepoutre, 175). Wharton Gray and Guild (320) recently studied a group of 30 women who had suffered from well established pyelitis during childhood. They found that 57 per cent, investigated as adults, showed definite stigmas of the previous infection, and that of these, 11 had experienced recurrent attacks, while 6 still had positive urine cultures for the bacillus coli. Only 1 of the 30 women had developed pyelo ureteritis of pregnancy, however, only 3 of them had become pregnant. These authors thought that their study did not furnish concrete evidence as to the importance of childhood pyelitis as an etiological factor in pyelitis of pregnancy. It probably does suggest, however, that with the persistent bacilluria, the stasis concomitant to pregnancy would, as the group of patients grows older, produce a much greater incidence of pyelitis in pregnancy.

Freudenberg (88) reports from the Kiel Frauenklinik that 10.1 per cent of their patients with pyelitis had had the disease previous to pregnancy. Petit (226) makes an analogous statement, while Crabtree (56), Prather (234), and Pugh (241) make the observation that previous pyelo-ureteritis, whether incurred in childhood or adult life, predisposes toward a recurrence in pregnancy. Stoelck (288) calls attention to the fact that many patients acquire pyelitis through small traumatic mucosal tears associated with the acts of masturbation, defloration and cohabitation. Seitz (271) points out that previous infections of the upper tract however acquired make for a poorer prognosis in subsequent attacks.

DIET

Diet as an accessory factor in the development of pyelo-ureteritis of pregnancy has never received more than superficial consideration. As far as can be learned no scientific work has been done upon the subject. Philipp (229) however, is of the opinion that a high protein diet may be more conducive to the occurrence of the disease than one in which fruits and vegetables have a suitable part. Schucke (159) believes that a diet which tends to ward off obstipation is of great importance in prophylaxis while Vignes (311) states that salt should be plentiful in the diet as hypochlorhydria is a causative factor and Berge (15)

stresses the importance of vitamins particularly A and D, and a diet which produces an alkaline urine, such as citrus fruits.

TRAUMA

Injury to the urethra, bladder, vagina, and cervix probably are only very occasionally concerned in the production of inflammatory states in the upper ureter and kidney pelvis, excepting in the puerperium. Prather (231) reports a high incidence of post partum pyelo-ureteritis in a group of patients who had some injury to the bladder during delivery. These bladders all contained much residual urine demanding evacuation, which was accomplished by repeated catheterization of the bladder. In an analogous group in which the post partum bladder retention was controlled by use of a retention catheter, no patient developed pyelo ureteritis. Prather (231) and Kaneaid (149) believe that the repeated trauma of urethral catheterization was responsible for the transmission of the bacteria to the upper tract. Rose (149) makes a plea for continuous bladder drainage instead of intermittent catheterization for similar reasons. Scott studied the so-called "catheter fever" by taking blood cultures from patients recently catheterized, and concluded that trauma of the urethra is sufficient to produce a transitory coliform bacilluria. The work of Walther and Willoughby (316) also points very strongly to the possibility of lymphatic extension from the posterior urethra to the kidney pelvis in post partum infections. These authors also believe that extension from the cervix as an aftermath of trauma during delivery should be considered as a source of infection, since they find that 75 per cent of parturient women have endocervicitis.

INCIDENCE OF PYELO-URETERITIS

Authorities vary widely in the figures which they quote concerning the incidence of pyelo-ureteritis. Baird (7) places the incidence at the Glasgow Royal Infirmary at 14 per cent, which is the highest figure to be found in current literature while at University College Hospital in London, Dodds (75) found only 1.1 per cent afflicted with the disease. The following table gives the data available at the present time.

TABLE IV.—THE INCIDENCE OF PYELO-URETERITIS

	Per cent
Kiel Frauenklinik (Freudenberg)	10.1
Boston Lying In Hospital (Crabtree)	2.1
New York Lying In Hospital (Traut)	2.2
London Guy's Hospital (Gibberd)	1 to 2.0
London University College Hospital (Dodds)	1.1

result is hydronephrosis and hydro-ureter. This pathological change, of course, precludes anything simulating a return to normal peristaltic activity on the part of the kidney pelvis and ureter

In view of what has been learned, largely as a result of the work of Creevy (59) and Wuellenweber (327), concerning the importance of the ureter as a pumping mechanism which normally keeps the intrapelvic pressure at a level below that in the bladder and thus avoids back pressure upon the renal cortex, one can visualize what damage permanent decompensation of the ureter may attain. In fact, there are those—Walker (315), Peters (225), and Hayes (110)—who are of the opinion that these changes bear a relationship to the transitory hypertensive toxemias of pregnancy and even hypertension of later life. The theories and the clinical data these authors present are suggestive and should stimulate further inquiry, however, they cannot be considered conclusive

Robecchi (246) reports a follow-up study in which he analyzed the results of pyelitis from five to thirty months after the acute attack. Only 23 per cent of the patients were found to be normal in all respects. The other 77 per cent showed albuminuria, pyuria, bacteriuria, and all had some degree of hydro-ureter. None of the patients showed reduced renal function

Haselhorst (109) studied 62 women after they had pyelo-ureteritis and found minor difficulties in 39, while 19 had exacerbations of the inflammation, and 3 had developed hypertension. He concludes, "pyelitis gravidarum is not the harmless disease which always heals itself spontaneously, postpartum, as is so often claimed, but it is, in a great many cases, active silently over a long period of years and forms a latent danger which can assume different forms"

Dodds (75) reports death in 16 per cent of his cases. In the postnatal follow-up of 124 patients, 27 had chronic pyelitis, 20 had bacteriuria alone, and 42 seemed quite well. Grieve (102) writes of his studies of 37 women some months after delivery. One had died of urinary complications, while 23 were found to be quite well. Eight, or 21 per cent, had failed to throw off the disease and suffered "impaired health" as a result of the latent chronic infection which they still were harboring

These results are presumably what may be expected from the older methods of treatment. They indicate ample room for improvement in the net result. This improvement now seems entirely possible, as will be indicated in the section on treatment

EFFECTS OF PYELO-URETERITIS OF PREGNANCY ON THE INFANT

As long ago as 1904, Cathala (31) made the following statement: "The prognosis for the child is grave (in pyelitis of pregnancy), as delivery may be premature, and infection may be transmitted to it." We have been slow in learning that prolonged treatment of the mother during the acute or subacute phase, in the hope of gaining a viable infant, may end in disappointment. Haselhorst (109) gives the fetal mortality as 10 per cent, while Traut (298) found it to be 12 per cent during a period in which the total fetal mortality from all causes, including pyelitis of pregnancy, was 42 per cent. These reports are in line with those of other observers

The cause of fetal death is often due to prematurity. In Freudenberg's (88) report the incidence of premature delivery was 161 per cent, and Baird reports premature parturition in 40 per cent of the primigravidas, and in 15 per cent of the multiparas

Intra-uterine death also occurs, though less frequently than premature birth, the only figure obtainable being 8 per cent (Traut, 298), while neonatal death occurs in 5 per cent of the cases. As pointed out by De Beaufond (70), intra-uterine and neonatal death referable to the infection of the urinary tract is due to bacteriemia, the infant becoming infected by passage of the colon bacilli through the placenta. De Beaufond reports that one infant survived, even though it had positive blood cultures for four weeks post partum. Athenstaedt (4) gives a good review of the literature up to 1933 on this subject

TREATMENT

The very real advances which have been made with regard to the treatment of pyelo-ureteritis are those which have come as a result of a more complete understanding of the history of infections in the upper urinary tract in the adult woman. This understanding focuses attention upon prophylactic care as the greatest hope in amelioration of the effects of this disease, toward which the normal physiological changes of gestation predispose, on the one hand, and, on the other, which dictates the necessity for urological treatment in its chronic stages following the initial attack, once it appears

It is quite essential in the approach to the subject of treatment to understand that the acute febrile exacerbations are merely the very obvious high spots of the disease process, and that usually following such episodes there are much longer—because they are chronic and asymptomatic—

bilateral the outlook is much more sinister, particularly if the patient be some weeks from term.

If the renal cortices are involved in the inflammatory process to such an extent that there is retention of non protein nitrogen substances in the blood of from 50 to 65 mgm per 100 c cm of blood the prognosis is grave (Mikulez Radecki 204 Philipp, 229). Higher levels of nitrogen retention are associated with an almost absolutely bad outcome to both mother and infant. It is therefore necessary, as part of the diagnostic procedure, to examine the blood chemically and to repeat this procedure from time to time during the febrile phase of the disease, as this is the only reliable index as to parenchymal involvement.

Mixed infections in which the colon bacillus and some secondary invader are involved are discouraging as Cathala (31) first demonstrated Seitz (271) and others have recently emphasized that these infections are more resistant to treatment and the ultimate outcome is apt to be disappointing.

Pyelonephritis that is extension of the inflammation into the cortex of the kidney is one of the most serious complications of the acute phase although it can also be an outcome of the chronic stage in rare instances. In the mildest form it amounts only to a localized inflammatory edema which closes off the collecting ducts and produces oliguria and nitrogenous retention. In the more severe suppurative types the foregoing results are found but in addition bacteremia, extension to the capsule with the formation of perinephritic abscesses and ultimately extension to the peritoneum are seen. The outcome of the severer types of complication is usually fatal.

Dozsa (77) has indicated the incidence of pyelonephritis complicating pyelitis as 15 per cent. To other workers this seems somewhat high. Traut (298) reports an incidence of 11 per cent. Furthermore he experienced a maternal mortality of 25 per cent among cases developing this complication. One of the patients did not develop an acute febrile phase at any stage of the disease.

Dozsa (77) first and others—Fruhholz (92) Lepage (174) Mayer (197) Paquet (218) and Vignes (311)—since have called attention to a much rarer complication which simulates acute yellow atrophy in many respects. This they refer to as the toxic type. In this disease the kidney pain and fever are not so marked and may be negligible. There are marked icterus and liver enlargement anemia intractable vomiting and diarrhea, as well as a rapid pulse dry tongue and marked weakness and sometimes ascites.

According to Preiss (238) there are over 250 cases reported in the literature in which ileus was a complication of pyelo-ureteritis of pregnancy. This author summarizes the different theories concerning the etiological relationship of the two entities ileus and pyelitis. Stoeckel (236) has given the most logical explanation. He believes that both have a similar background in that normal pregnancy, by means of its hormonal mechanism produces atony of the ureter as well as atony of the bowel. It produces the sleeping ureter with stasis dilatation and sometimes, pyelitis as a sequel on the one hand and obstipation of the bowel on the other and Stoeckel believes that the latter is merely a minor degree of development of what one sees in ileus. He therefore believes that they have a common cause and that it is somewhat remarkable that ileus is not more commonly encountered. The treatment before term is laparotomy because adhesions or a volvulus might be the cause and these can bring about gangrene. At term, the uterus should be emptied promptly and then if the ileus remains intractable laparotomy is indicated for the reasons given above. Other recent writers on this subject are Sennewald (275) Klein (152), Hilgenberg (10), Hellendall (113) and Seitz (271).

EFFECTS OF PYELO-URETERITIS ON THE MOTHER

The immediate effect of infection of the upper urinary tract is of course, the production of varying degrees of fibrosis of the ureter and renal pelvis the extent depending upon the duration of the infection, the number of recurrent attacks and the type of infective agent for it has been shown that some micro-organisms induce a much greater fibroblastic response than others. The fibrosis may be so slight as only to retard the recovery of ureteral peristalsis following delivery. On the other hand it may and too frequently does produce such an extensive infiltration of scar tissue as to leave the tract devoid of any intrinsic motility. If the scarring is localized the result may be permanent strictures with hydro-ureter and hydronephrosis above the point of constriction. Often there is prolonged kidney infection with stone formation, according to Dozsa (78) and Jacobi (134).

As Jacobi (134) has shown in a beautiful series of roentgenographic studies the most common result of chronic pyelitis extending through a series of pregnancies with exacerbations during the pregnant periods is the fixed fibrosed ureter and kidney pelvis the fixation being due to fibrosis in the dilated state so that the end

Treatment of the acute phase occurring in the puerperal woman is a much simpler problem, as adequate drainage can usually be secured, and one is at liberty to use non-irritating antiseptics, such as sulfanilamide, at once

Effective treatment of the chronic stages of the disease has, in the past, required some facility with urological technique. However, if the recent experience of Helmholtz (117), Long (182), and others with sulfanilamide is borne out by prolonged trial, it may be possible greatly to simplify the treatment by elimination of the necessity for ureteral catheterization. In general there are three objectives to be attained in the treatment of chronic infection of the urinary tract, namely, eradication of the causes of residual urine in the bladder, ureter, or kidney pelvis, cure of the infection, and avoidance of pregnancy until the two former have been accomplished

Crabtree (57), has shown that with the best available care in the presulfanilamide era, patients having had pyelo-ureteritis respond and are usually cured within four months post partum. If they are not cured under these circumstances, the cause is usually debility, abnormal persistence of ureteral changes incident to pregnancy, or bladder damage with residual urine

As stated above, ammonium mandelate in dosage of 12 gm of the drug per day during periods of seven days has been found to be of great assistance in clearing up the chronic infections

Long (182) has elaborated a technique for the use of sulfanilamide which is calculated to attain certainty in the use of this drug. It has been shown that individuals vary markedly in their ability to excrete the unconjugated fractions of the drug (Marshall, 195), therefore, Long has found it necessary to determine the amount they can eliminate through the kidneys and then provide dosage sufficient to afford the degree of saturation which he has previously demonstrated as necessary to kill the offending organism *in vitro*. It is to be hoped that, as a result of these and similar well controlled investigations, general rules for the use of sulfanilamide may be developed, which will make its use more simple as well as certain and safe. Thus far, we have not arrived at a well authenticated method for the use of sulfanilamide. It seems wise to consider this form of therapy as distinctly in the experimental stage and, therefore, not to be recommended at this time without definite reservations

The criteria for cure of chronic pyelo-ureteritis should consist of a series of three negative cultures of bladder urine, separated by intervals of at least one month.

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stages of infection which must be managed effectually. Treatment confined to the acute febrile stage begs the question and bespeaks a lack of insight. For this more complete point of view, we are indebted to those students of the disease who have observed it critically over a considerable period of years among whom must be named particularly Stoeckel, Weibel, De Beaulieu, Baird, Kretschmer, and Crabtree.

The following remarks on treatment are made with the feeling that much of what is said may soon need revision because of the advent of sulfanilamide therapy. However the use of that drug in its various forms is in such a chaotic state as to make assessment of its true value impossible at the present time.

Treatment of the acute phase in pregnancy. All writers agree that for a period of four or five days patients should be treated conservatively according to the simple formula of rest in bed with frequent changes of position, forced fluids, saline catharsis, soft diet and therapy to render the urine either strongly alkaline or acid. As over 60 per cent of the patients respond to this simple regimen it is worth while to continue its use. If loss of fluids by emesis or inability to take fluids by mouth is a feature of the disease, parenteral replacement is of the greatest importance. At the same time a careful history should be taken to discover the possibility of previous attacks, and bacteriological cultures of the urine are desirable because they will reveal the type of organism, while blood chemical evaluation of the non protein nitrogen level and some form of differential kidney function test (the intravenous pyelogram being the simplest and most useful), should be carried out. These latter procedures will show whether a mixed infection is present, whether the renal cortices are involved dangerously, and whether previous kidney damage in one or both kidneys has been sustained. All these factors alter the prognosis and hence the degree of conservative treatment that is justified.

With this data in hand the physician is prepared to meet the complications which arise. If the acute attack be established by the history to be a recurrent one or if the infection be a mixed one the assumption that the patient may not respond promptly to simple therapy and also that serious complications may occur is justified. If diminished kidney function is present in the kidney not involved in the acute attack caution is indicated. In bilateral pyelo-ureteritis and in the presence of a rising nitrogen level in the blood associated with oliguria and leucine and tyrosine in the urine (Philipp 229) extreme caution is

necessary and usually prompt evacuation of the uterus is indicated.

If after the initial period of the conservative therapy outlined above, lasting from four to seven days the temperature remains elevated more active treatment is indicated. It is usually advisable that the indwelling ureteral catheter of large size be used in the attempt to establish more adequate drainage. When the response to this form of treatment is not satisfactory a day or two of rest and then reinsertion may be advised it being presupposed that none of the more serious complications have developed.

Mandelic acid therapy as developed by Rosenheim (251) and Helmholtz (116) is usually efficacious during pregnancy, and probably should never be used in the acute phase. However it has been most useful post partum in the clearing up of chronic infections. Dosage should approximate 22 gm. of the drug daily, in divided doses with fluids limited to 1500 ccm. and sufficient ammonium chloride by mouth to render the urine very strongly acid to methyl red as the indicator. There are many recent reports (Helmholtz 116, Long 182, Cook 45) stating that sulfanilamide by mouth (a dosage ranging from 2.5 to 6 gm. per day) is valuable. This substance is said to have a decided advantage over any other urinary antiseptic in that it is effective in an alkaline urine, whereas mandelic acid, beta-oxylbutyric acid and other substances are bactericidal only in an acid medium. In addition, sulfanilamide has been shown to penetrate all tissues of the body about equally with the exception of the bony skeleton and brain, so that it is not merely a substance working on the surface of a hollow viscus as are most other so-called urinary antiseptics.

Fortunately most patients respond to the above treatment or some modification of it. However there will be a few who fail to improve under any conservative therapeutic regime and in these cases the physician must face the necessity of terminating the pregnancy. Only a few writers fail to agree with this point of view. Most of them hold not only that the termination of pregnancy is a life saving procedure that must occasionally be used but also that if the fetus be several weeks from term irreparable damage may be sustained by the mother if evacuation of the uterus is not carried out. The knowledge that the infant may be lost regardless of the course followed is an added indication for considering the mother and her future welfare of primary importance. In the statistics of the Kiel Frauenklinik (88) the incidence of therapeutic interruption of pregnancy was 7.7 per cent.

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GYNECOLOGY

UTERUS

Taylor, H. C., Jr., and Millen, R : The Causes of Vaginal Bleeding and the Histology of the Endometrium After the Menopause. *Am J Obst & Gynec*, 1938, 36 22.

Among 406 gynecological cases admitted to the Roosevelt Hospital, New York, for vaginal bleeding after the menopause, some type of malignant tumor was present in approximately 63 per cent

Benign tumors of the uterus and ovary were the lesions chiefly responsible for the symptom in 17 per cent of the cases. Of special interest was the association of hyperplasia of the endometrium with typical cystic pseudomucinous tumors of the ovary in two instances

Inflammatory lesions, usually in the cervix or vagina, were the apparent cause of bleeding in 11 per cent

In the remainder, or about 8 per cent, no gross lesion to explain the bleeding was present in the pelvis. Several of this group showed evidence of a late ovarian effect on the endometrium or of an endometrial hyperplasia due to this or other causes. These instances of hyperplastic changes in the postmenopausal endometrium are important as possible precancerous lesions. EDWARD L. CORNELL, M.D.

Phaneuf, L. E.: Irradiation in the Treatment of Carcinoma of the Uterus, with Special Reference to Corpus Carcinoma. *Am J Roentgenol*, 1938, 39 855.

The history of gynecology has been written around the treatment of uterine carcinoma. During the last two decades irradiation with radium and roentgen rays has supplanted surgery in the treatment of cervical cancer. No such radical change has taken place in the management of cancer of the uterine body. Surgery, in the form of a panhysterectomy with the ablation of the adnexa, has given five-year arrests in from 60 to 70 per cent of the cases in some series. Irradiation has been reserved, for the most part, for patients advanced in years, having definite contra-indications to operation because of constitutional lesions and because of the advanced stage of the disease. Even in this group arrests have been observed, and the palliation obtained in others has been beneficial. The use of pre-operative radium irradiation and surgery, and postoperative deep roentgen therapy may improve the results of the future. A small series of 20 cases of corpus carcinoma treated by irradiation is presented in the form of a preliminary report.

In this group of cases the oldest patient was seventy-eight years, and the youngest forty years. A hysterectomy was performed on the youngest woman four months after intra-uterine application of radium. All others were treated by irradiation

alone. Two patients are alive and free from recurrence for more than seven years, 1 patient is alive and free from recurrence for more than six years, 1 patient who was free from recurrence more than six years after the initial treatment, died of diabetes, and 1 patient is alive and free from recurrence for more than five years. Thus, 5 patients, or 25 per cent, survived more than five years. Five patients, or 25 per cent, are known to have died from cancer, 3 patients, or 15 per cent, cannot be traced, and the 7 others, or 35 per cent, have been under observation less than five years.

J. THORNWELL WITHERSPOON, M.D.

Corscaden, J. A., Kasabach, H. H., and Lenz, M.: Intestinal Injuries after Radium and Roentgen Treatment of Carcinoma of the Cervix. *Am J. Roentgenol*, 1938, 39 871.

In the records of 350 cases of carcinoma of the cervix and of 92 cases of fundal carcinoma treated with radium and x-rays, symptoms related to the lower alimentary canal were noted in 139 patients. The observed conditions ranged from the simplest proctitis to more severe inflammation in 16 cases and to ulceration in 12 cases, there was cicatricial stenosis in 1 case and perforation in 5 cases. Fifteen cases illustrating the more serious of these complications are reported in detail. While the technique of treatment and the dosage were not uniform, the following standard was approximated in all.

Radium factors. Radium tubes were placed in tandem in the cervico-uterine canal in sufficient numbers to occupy the length of the canal. Filtration was secured with 1 mm of platinum plus 1 mm. of rubber. Three vaginal applicators were placed, one against the cervix, and one in each lateral fornix. The filtration was the same as already mentioned plus 5 mm of cork, rubber, or gauze. The bladder and rectum were firmly forced away by gauze packing. The total dose was usually given in one or two applications. The applicators, containing a total of 175 mgm., were left in place about forty hours, which produced a total dose of approximately 7,000 mgm hr.

Roentgen-therapy factors. Two hundred kilovolts, 50 cm distance, 1.5 mm of copper or 2 mm of copper plus 1 mm of aluminum filtration. Between 300 and 400 roentgens were given each day, through several fields. The duration of the course was from twenty-one to thirty days.

The authors believe that the alimentary symptoms observed, ranging from nausea and diarrhea to gross necrosis and perforation, were due to a true radiation enterocolitis rather than to a more general intoxication. In 16 cases abdominal cramps and diarrhea with mucus and blood streaks in the stools suggested a more intense irritation. The mucosæ of the rectum and sigmoid were swollen, red, and dotted

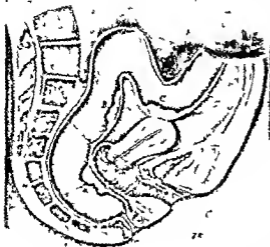


Fig. 1. Diagram showing the sites of injury in the lower bowel. A in rectum adjacent to vagina. B rectosigmoid at some distance from cervix. C a loop of sigmoid adherent to fundus.

with numerous punctate hemorrhagic spots. Spasm of the rectosigmoid was present in 6 of the patients in this group. These manifestations were a continuation of those experienced during treatment and lasted up to four months. All of the patients healed spontaneously.

Ulceration occurred in the rectum (Fig. 1A) in 4 cases, in the rectosigmoidal region (Fig. 1B) in 4 cases, in the loop of the sigmoid (Fig. 1C) in 2 cases, and in the small intestine in 2 cases. The symptoms were abdominal cramps, diarrhea, and frequent and bloody stools. Those occurring in the large bowel usually presented themselves several months after the termination of treatment. In the rectal cases recovery was spontaneous after from two to twelve months. In the cases of ulcer of the rectosigmoidal region 2 patients recovered spontaneously after some months and the other 2 died following colostomy to relieve obstruction. Both patients with ulcers in the loop of the sigmoid developed obstruction. One survived a colostomy and the other did not. In the 2 cases in which severe injury to the small intestine occurred the symptoms were continuous with those arising during treatment. Both patients died within two months. A diffuse fibrino-purulent peritonitis without perforation was present.

Rectovaginal fistula occurred in 5 cases. All of the fistulas were accompanied by the continuance of the carcinoma.

Some of the patients were studied roentgenologically after having had repeated barium enemas. In the more severe cases varying degrees of stricture, spasm, and exaggeration of the mucosal folds were observed.

The treatment of the ulcers was palliative until signs of obstruction appeared. Paregonic and a bland diet were of value. Operative treatment of the obstruction was satisfactory when simple colostomy could be performed. When an attempt was made to remove the affected area, the result was unsatisfactory.

Several forms of cicatricial deformity of the rectum were observed:

1. A leathery ridge 6 or 8 cm. from the anus extending laterally to the pelvic walls due to contraction of the parametrial tissue. There were no symptoms. This deformity is of interest because it is difficult to distinguish it from carcinomatous extension.

2. An annular stricture without previous ulcer. This was observed once.

3. Atrophy of the mucosa of the anterior rectal wall over an area of 5 or 6 cm. This was observed frequently. The only symptom was occasional streaks of blood in the stool.

4. The healing of the ulcers described, which left a puckered scar.

The authors wish to emphasize the importance of the time factor in dosage. Radiation injuries have practically been eliminated in their cases without reduction of either the total milligram hours or roentgens administered. This was accomplished by reducing the number of milligrams used in the uterovaginal applications from 175 to 70 and increasing the duration of the application from forty to one hundred hours, and by reducing the daily roentgen dose from 300 to 400 roentgens to 100 to 200 roentgens, and the size of the field from 20 by 20 cm. or 15 by 20 cm. to 10 by 15 cm. or less, and increasing the duration of the course of treatment from twenty one to thirty, forty or more days. The variation in dosage is determined by the occurrence of alimentary symptoms and the susceptibility of the skin. Severe diarrhea, nausea, and abdominal distress are considered as warnings of possible bowel injury. The adoption of this technique by the authors has decreased the incidence of bowel injuries from 8.7 per cent to practically nil.

DANIEL G. MORTON, M.D.

Frazell, E. L. The Correlation of Calculated Tumour Doses and Five Year Survivals in Radiation Therapy of Cancer of the Cervix. *Am. J. Roentgenol.* 1938, 39, 801.

The prognosis for a five year cure of carcinoma of the cervix depends to a large extent on the clinical stage of the disease when treatment is started. There seem, however, to be other factors that influence the prognosis. The importance of the histological type of the tumor and of the age of the patient are debatable. The author believes that the degree of ade-

quate irradiation of the tumor is of utmost importance as to the final prognosis

The author studied 136 patients with carcinoma of the cervix treated by irradiation during the year 1930. Most of the patients in this series were treated by preliminary roentgen radiation through four pelvic fields, one or two weeks later radium was applied locally, and about twelve weeks still later a second roentgen cycle was begun.

The minimum dose of irradiation given to each tumor was then calculated in terms of threshold erythema doses. These calculated doses were then correlated with the five-year end-results. It was found that patients receiving less than 3 threshold erythema doses had a five-year survival rate of 16 per cent, those receiving from 3 to 6 doses a rate of 24 per cent, those receiving from 6 to 9 doses a rate of 22 per cent, those receiving from 9 to 12 doses a rate of 47 per cent, and those receiving more than 12 doses a rate of 67 per cent.

On the basis of this data the author concludes that it is essential to use high threshold erythema doses of irradiation in therapy of carcinoma of the cervix. Methods should be found to increase the irradiation dose to the parametria without causing irreparable damage to vital structures. Any method of radiation therapy delivering less than 6 erythema doses to the parametrium will fail to control the disease in the majority of cases.

RONALD R. GREENE, M.D.

EXTERNAL GENITALIA

Te Linde, R. W.: The Treatment of Gonococcal Vaginitis with the Estrogenic Hormone: Further Studies. *J Am M Ass*, 1938, 110: 1633

Te Linde reports success with the use of amniotin in the treatment of 175 patients with gonococcal vaginitis. All, except 16 to whom the product was given hypodermically in oil, were cured by the use of amniotin vaginal suppositories. No patient who has failed to benefit from this treatment has yet been encountered. The first 100 patients who had undergone treatment were seen after from three months to two and one-half years and 98 of them were found to be well. No clinical evidence of any harm due to the treatment was found, and laboratory investigations have confirmed this observation. The increased acidity which takes place in the vagina as a result of the action of the estrogen is a factor in overcoming the infection. Since results were not nearly so good when another acidifying suppository was used, it is believed that amniotin introduces an additional curative factor. Te Linde is of the opinion that this factor is the covering of the vagina with thick epithelium, which prevents reinfection of the subepithelial tissues and thus permits the inflammatory process in them to subside. Clinical observations and biopsies have indicated that the essential lesion of gonococcal infection of the lower part of the genital tract in female children is vaginitis.

CHARLES BARON, M.D.

Wharton, L. R.: A Simple Method of Constructing a Vagina. *Ann Surg*, 1938, 107: 842

A new operation for the construction of a vagina is presented. It is based upon the remarkable ability of the vaginal epithelium to proliferate and cover raw surfaces. This is essentially the manner in which the vagina develops in the fetus.

After an incision is made into the external mucous membrane, or across the dome of the rudimentary vagina, a space is dissected between the bladder and the rectum by blunt dissection. It is only necessary to follow the plane of cleavage provided by the fibro-areolar tissue between the layers of subvesical and perirectal fascia. Into this newly created space is introduced the vaginal mold, covered by a condom, which completes the operation. The mold is essential as a means of keeping the vaginal space open so that the vaginal epithelium may cover it. The ideal mold should be very light so that it will not cause any pressure on the surrounding organs, and it should be firm so that its shape may be preserved against the continual pressure of the pelvic muscles and the surrounding structures. Molds of balsam wood or of melted paraffin have proved most satisfactory.

The mold is allowed to remain in the vagina for a period of three weeks. During this time it requires no attention other than that of making certain that it does not come out. The patient is kept in bed as long as the condom is in place. Coitus is absolutely prohibited for a period of at least two or three months, or until the vaginal epithelium has become thick and tough.

This operation seems feasible only when some vaginal epithelium is present.

CHARLES BARON, M.D.

MISCELLANEOUS

Pieri, R. J.: The Female Perineum: Episiotomy and a Technique for Its Repair. *J Am M Ass*, 1938, 110: 1738

As a result of excessive strain during labor, overstretching or laceration of the muscles of the perineum frequently occurs. This is invariably accompanied by single or multiple tears in one or more of the various layers of pelvic fascia, which in many places is in such intimate relation to the perineum as to be considered a part of it. These injuries, by weakening the support of the pelvic organs, constitute one of the chief factors in the production of such sequelæ as cystocele and rectocele.

In performing an episiotomy, the advantages to the baby lie chiefly in the shortened period of pounding of the fetal head on the perineum and the consequent reduction in the incidence of cerebral injury. As for the mother, the second stage of labor is shortened, while the restoration of the pelvic floor after episiotomy, properly performed, is usually better than that which is observed even after many normal deliveries in which no visible lacerations

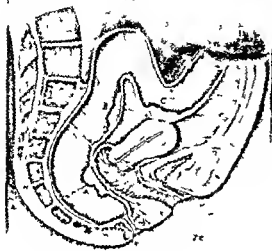


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with numerous punctate hemorrhagic spots. Spasm of the rectosigmoid was present in 6 of the patients in this group. These manifestations were a continuation of those experienced during treatment and lasted up to four months. All of the patients healed spontaneously.

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4. The healing of the ulcers described which left a puckered scar.

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DANIEL G. MORTON, M.D.

Frazell, E. L. The Correlation of Calculated Tumor Doses and Five Year Survivals in Radiation Therapy of Cancer of the Cervix. *Am. J. Roentgenol.* 1938 39 861.

The prognosis for a five year cure of carcinoma of the cervix depends to a large extent on the clinical stage of the disease when treatment is started. There seem, however, to be other factors that influence the prognosis. The importance of the histological type of the tumor and of the age of the patient are debatable. The author believes that the degree of ade-

the authors recommend vaccinothrapy, diathermy, and short-wave therapy. Surgical methods are gradually being eliminated.

The authors then discuss physiotherapeutic measures which are used in gonorrheal vulvitis, vaginitis, urethritis, endometritis, salpingo-oophoritis, and pelvic peritonitis.

In recent years vaccinothrapy has come to the fore but the authors believe that this form of therapy, if employed alone, does not offer permanent relief from gonorrhea or its complications.

Other therapeutic measures which have been employed in the treatment of gonorrhea in the female include serum therapy, hormonotherapy, diathermy, and short-wave therapy.

Concerning chemotherapy, for several years the intravenous administration of acridine derivatives has given some highly promising results but, unfortunately, the method has not found general acceptance and has been practically abandoned at present.

During the past year sulfanilamide therapy has come into general use. With elevated dosage, it has yielded noteworthy results in the treatment of gonorrhea, but according to a review of the literature made by the authors, it has also caused many accidents. When employed with low dosage and in combination with other therapeutics, its efficacy is still questionable. In spite of its disadvantages, this form of therapy is highly promising. Among the most common untoward reactions observed in connection with sulfanilamide are disturbances such as skin eruptions, headache, asthenia and dizziness, digestive disturbances, subicteric states, anemia, cyanosis, and menorrhagia.

Among a series of 103 patients receiving sulfanilamide (1162 F) there were observed 46 adverse reactions in 37 patients. In another series of 50 patients receiving rodilone [1399F, di (para-acetylaminophenol) sulfone] there were observed 31 adverse reactions in 26 patients.

Sulfanilamide derivatives are indicated in gonorrheal vulvovaginitis, bartholinitis, urethritis, cystitis, cervicitis, endometritis, and gonorrheal involvement of the adnexa. RICHARD E. SOMMA, M.D.

Turunen, A.: External Endometriosis and Sterility (Endometriosis externa and Stenlitaet) *Acta obst et gynec Scand*, 1938, 18 237

The author concludes that external endometriosis is an extremely important cause of sterility. He bases this conclusion on a study of 159 operatively proved and corrected cases in the gynecological clinic at Helsingfors during the period from 1930 to 1936.

There were 113 married women in this group and, reckoning the normal period between births of the Finnish married woman as three and one-tenth years (Kahanpaa), 48 (42.5 per cent) of these women had been without a pregnancy for approximately three years and were probably primarily sterile. Fifty-six (49.5 per cent) had had one or more children, but at the time of operation had not been pregnant for approximately three years and were secondarily sterile. Of the 9 women reckoned as fertile, 5 were not known to be actually fertile, as they had had no pregnancies since marriage, they had merely, at the time of operation, not yet been married for three years.

The condition in 66 of these women (34 primarily and 32 secondarily sterile) could be corrected by a conservative operation, by loosening of the adhesions, excision of endometriotic foci, or reperi-tonealization, and 21 (12 of the former and 9 of the latter) later became pregnant, most of them within the first year. Therefore, a considerable number of women who were sterile in the presence of external endometriosis were relieved by conservative operation, and the author believes that the attempt should be made to diagnose this condition sufficiently early that conservative measures may be used in its treatment. Recurrence following this operation is extremely rare.

JOHN W. BRENNAN, M.D.

occur, the integrity of the soft parts often remaining as unimpaired as they were in their nulliparous state.

In the absence of any indication for earlier intervention delivery is not attempted until the presenting part is on the levators and there is evidence of pressure on the vulvar outlet. After the usual preparation for delivery, the bladder is catheterized and the perineum gently ironed out with the liberal use of neutral liquid soap. Care should be exercised to avoid overstretching of the parts and too rapid dilatation. The former causes future loss of muscle tone and damage to the fascia while the latter favors laceration.

The site of incision depends on the operator; the right or left mediolateral episiotomy being favored by most accoucheurs chiefly because it avoids the rectum. The point of direction extends from the midpoint of the posterior aspect of the vaginal orifice and proceeds along a line midway between the sphincter and the ischial tuberosity.

The technique of repair causes a minimum amount of postoperative discomfort. All sutures are of a fine texture and coincide with Harvey's opinion that it is never necessary to use any suture stronger than the tissue through which it passes. Single sutures are preferred to double sutures, since the difference in their holding strength is practically negligible.

The first layer of sutures (chromic No. 1) is interrupted. The sutures are passed widely to reduce tension on the line of healing and tied just securely enough to secure coaptation. Care is observed of course to avoid perforation of the rectum. The first stitch is submucous and is passed in circular fashion around the upper angle of the incision. This brings together any fibers of muscle or fascia which might have separated under the mucosa. Neglect in this detail favors subsequent pouching of the posterior vaginal wall or even a later rectocele, if such an occult separation exists.

The second layer of sutures includes the fascia of Colles. No chromic gut is selected because of its ample strength (9 lb.) in fascia. It is at this time that the 'crown' stitch is inserted which brings together the severed portions of the hymen; the needle being inserted obliquely upward in the base of the labia minora to secure in its grasp the retracted fibers of the severed constrictor cunnii (bulbocavernosus) muscle. To overcome this retraction and to prevent gaping of the vagina two such sutures may be required. To avoid dead space any muscle underlying the fascia is included in the bite of the needle as it is passed from one side to the other.

When completed the second layer usually brings into apposition the edges of both the mucosa and the skin respectively. Frequently however to insure this a third or subcuticular layer of double or triple catgut is placed; a fine skin needle being used. No sutures are passed through either the vaginal mucosa or the skin and those portals of

entry which invite pathogenic organisms from without to follow the suture into the tissues below are thus eliminated.

As a final step the line of incision is effectively sealed by gentle coaptation on its everted edges by means of Allis clamps. These are applied and permitted to remain clamped for only a few moments while the vaginal packing is removed; any blood clots are expressed, and preparations are completed for the transfer of the patient to her bed. Removal of the clamps leaves a fine linear scar which, for a brief interval remains elevated as a result of the elevation, and then becomes almost imperceptible as the elevation recedes.

No case of infection or 'breaking down' of the perineum has been observed in the present series of more than 400 cases. CHARLES BABCOCK M.D.

Fabre M. Papillon F.A., and Pecker, A. The Treatment of Gonorrhea of the Female Reproductive System (*Les traitements de la blennorragie génitale de la femme*). Rev. franç. de gynéc. et d'obst. 1933 33 311.

The authors point out that it is frequently difficult to find the gonococcus in the female generative tract. The treatment of gonorrhea in the female therefore is often intricate and requires considerable patience and perseverance on the part of the physician. The clinical picture and the bacteriological findings should be constantly correlated in outlining the course of therapy.

Fabre, Papillon and Pecker divide the most commonly used therapeutic methods for gonorrhea in the female into two general groups: (1) local therapeutics, either medical or surgical and (2) systemic therapeutics.

In considering local treatment the authors discuss the various procedures employed in the therapy of gonorrheal vulvitis, vaginitis, Bartholin's and urethritis. These consist essentially of irrigations with potassium permanganate solutions and the application of silver salt preparations. Chronic gonorrheal cervicitis may be treated medically by the application of silver salts or by other forms of chemical cauterization, or by surgical methods such as electrocoagulation of the cervix, trachelorrhaphy and cervical amputation.

Gonorrhea usually also produces a chronic endometritis which however shows a tendency toward spontaneous healing. It may be treated by curettage followed by the topical application of zinc sulfate or silver salts. It should be remembered however that in cases of acute gonorrheal endometritis intrauterine manipulations should be strictly avoided.

Gonorrheal salpingo-oophoritis and pelvic peritonitis should be treated systemically by means of vaccination, chemotherapy, or proteinotherapy. All surgical interventions in these conditions are positively contra-indicated unless there is an accumulation of pus in the cul de sac in which case a colpotomy should be considered. In chronic cases of pelvic peritonitis with involvement of the adnexa

Pregnancy obviously adds to the danger and difficulty of the management of diabetes. The obstetrical risk is somewhat increased through a tendency toward hydramnios, excessive size of the child, and especially infection when eczema of the vulva is present. The chief aim of future treatment must be to make obstetrical operations unnecessary by means of medicodietetic management. The pregnant diabetic patient must be watched very closely and efforts made to avoid hyperglycemia and acidosis. With the new insulin it is hoped that great variations in the blood-sugar concentration can be avoided and that the prognosis for the diabetic mother, and especially for her child, can be improved.

WALTER H. NADLER, M.D.

LABOR AND ITS COMPLICATIONS

Insulander, M.: The Relief of Pains in Childbirth. *Acta obst. et gynec. Scand.*, 1938, 18 179

The author reviews her impressions of 23 Lying-in Hospitals which she visited in the United States. A great many medicinal substances were employed to alleviate the pains in childbirth, even at an early stage of the delivery. This applied chiefly to the private hospitals, the municipal hospitals not having at their disposal a large enough staff for continued supervision of the patient.

Barbituric-acid preparations, the combination of morphine and scopolamine, and paraldehyde were the preparations most frequently used. All of them give good amnesia and do not lessen the effect of the labor pains. Many patients, however, become very agitated, and the number of artificial deliveries is increased. Furthermore, the children frequently become apathetic.

The increased number of artificial deliveries renders unsuitable the introduction of the American preparations into Sweden. Their employment is possibly adapted to the very active American obstetrics. Even in some quarters of the United States there is to be found a marked reaction against the wide-spread use of analgesics in childbirth.

In England laughing gas was used to a large extent. It is administered with an apparatus controlled by the patient herself. It was the method that seemed to give the best promise for the future.

In Germany ether or chloroform was used almost exclusively. Other preparations were considered too dangerous.

CHARLES BARON, M.D.

Leidenius, L.: Causes of Death at Childbirth. Statistical Study from the Gynecological-Obstetrical Clinic at Helsingfors (Ueber die Ursachen der Partussterblichkeit Statistik der Frauenklinik in Helsingfors). *Acta obst. et gynec. Scand.*, 1938, 18 24

This article is based on 47,793 deliveries at the University Clinic at Helsingfors. The author divides these deliveries into two ten-year periods, from 1914 to 1923, and from 1924 to 1933, this division tending to suggest that no considerable reduction in the

causes of morbidity had been attained in spite of all efforts. Of the patients, 0.45 per cent and 0.38 per cent, respectively, died, about half of the deaths in each period being due to infection. However, the great majority of the infections were present before the patients entered the clinic.

The author believes that further reduction of the mortality can best be attained by prophylaxis, especially in the infectious and toxic cases (23.7 and 27.1 per cent, respectively), and by proper care during pregnancy of the patients with weak hearts (12 per cent of all the patients who died during the second ten-year period). Financial assistance and the establishment of stations for childbirth, within easy reach of every pregnant woman, are also suggested.

JOHN W. BRENNAN, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Fortin, F. F.: A Comparative Study of Posterior Pituitary Extract Administered at the Onset of and After the Completion of the Third Stage of Labor. *Am. J. Obst. & Gynec.*, 1938, 35 761

The optimum time for the administration of pituitary extract in controlling post-partum bleeding is an unsettled question. A comparative study of the prophylactic administration of pituitary extract in the third stage of labor, and after completion of the third stage, is presented. The author's study involved 1,100 cases in each series and the results obtained are as follows:

1. The general average blood loss and the group percentage distribution are too nearly alike to concede an advantage to either method.

2. The investigation of induced and stimulated labors yielded inconsistent results.

3. There is a 5.5 per cent reduction of the blood loss in normal cases and a 6 per cent reduction of the average loss of blood in operative cases when pituitary extract is administered prophylactically. The maximum saving is less than an ounce.

4. Prophylactic administration reduced the incidence of post-partum hemorrhage by 2.7 cases per thousand. It had no effect on the cause of hemorrhage, but it reduced the blood loss in hemorrhages due to atony by as much as 16.5 per cent, and inasmuch as the average post-partum hemorrhage with an atonic uterus amounted to 1,060 c.c., the saving was considerable.

5. The earlier administration of pituitary extract shortened the third stage of labor and caused 11 per cent more patients to terminate this stage within four minutes. This helped to increase the number of patients in the group having the lowest blood loss.

6. If the placenta is delivered within five minutes, prophylactic injection does not lessen the blood loss appreciably. However, when the third stage of labor lasts between six and ten minutes the blood loss is reduced 14 per cent, and when the placental stage requires more than ten minutes the blood loss is reduced 7.5 per cent. The average blood loss in these two groups was 250 and 380 c.c., respec-

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Mahfouz N. P. *Ectopic Pregnancy J Obst & Gynaec Brit Emp* 1938, 45, 309

In this article the subject of ectopic pregnancy is considered in full and the comments are supported by observations upon 120 cases. The following etiological factors are discussed: distortion of the lumen of the tube by peritoneal adhesions, the formation of blind pockets by the adhesion of adjacent mucosal plaques incident to inflammation and its subsequent healing delay in the downward passage of the ovum due to tubal stenosis or to inefficiency of peristalsis and interference with the passage of the ovum caused by mucosal polyp or by the pressure of tumors in the wall of the tube or in adjacent organs. Sixty-five of the author's patients were over thirty years of age and more than half gave a history of previous salpingitis and sterility.

Of the 120 cases, 4 were tubo-abdominal (secondary abdominal), 1 was ovarian, 1 was primary abdominal and 5 occurred in a rudimentary uterine horn. The remainder were definitely tubal, the vast majority occurring in the ampullary and isthmic portions. Rupture into the peritoneal cavity occurred in 58 per cent (in some cases after death of the fetus); intratubal rupture occurred in 27 per cent and rupture into the broad ligament occurred in 5 per cent. In 11 patients pregnancy advanced to the later months of these only 2 came for treatment while the child was alive and viable. In 3 of the 12 cases pregnancy occurred in the ampullary portion of the tube and proceeded to term without rupture.

The rare varieties of ectopic gestation—the interstitial the ovarian and the abdominal—are discussed in some detail. Attention is called to the relatively high incidence of fetal abnormalities in cases of ectopic pregnancy. Probably this is due to nutritional deficiency induced by faulty placentation. When the fetus is not removed it becomes mummified or calcified. Lithopedions were found in 3 per cent of the author's cases.

The four cardinal symptoms of ectopic pregnancy, viz. amenorrhoea, repeated attacks of pelvic pain, irregular uterine hemorrhage and the passage of a decidua cast were seldom present together in the author's series. Pain was present in 65 per cent, irregular hemorrhage in 70 per cent and amenorrhoea in 35 per cent and passage of a decidua cast occurred in 25 per cent. The differential diagnosis is discussed.

In the rare cases in which the diagnosis of a ruptured tubal pregnancy is made the gravid tube should be removed without delay. Occasionally a more conservative operation may be done; the alternative is salpingotomy with enucleation. Although the possibility of a repetition of pregnancy in the same tube is recognized the author believes

that this operation is indicated for certain young women who are very desirous of bearing a child. For interstitial pregnancies hysterectomy is usually the safest procedure. When hemorrhage is diffuse and the patient's condition is poor immediate operation is indicated. Infusions or transfusions are indicated only after the operation has begun. In the event of small encysted hematoceles which are not enlarging the patient may be treated expectantly. Operation should be performed however if the hematocele is enlarging or is already very large or if the Aschheim-Zondek test remains positive.

For advanced ectopic pregnancy, immediate operation is advised whether the fetus be alive or dead. The danger of removing the placenta depends upon its location and not upon whether the fetus is living or dead. When an advanced tubal pregnancy exists there is no difficulty. If a secondary abdominal pregnancy exists the danger is great. The proper method of managing the placenta depends upon circumstances. In 1 case the placenta was peeled off without important hemorrhage. In a second case the placenta was left in place and a subsequent laparotomy revealed it to have been completely absorbed. A third patient in whom the placenta was marsupialized died.

The mortality of the 120 cases was slightly less than 2 per cent. The article is accompanied by excellent illustrations. DAVIES G. MORSON, MD.

Brandstrup E. and Okkels E. *Pregnancy Complicated with Diabetes J Obst & Gynaec* 1938, 18, 136

Twenty-two instances of pregnancy in 19 diabetic patients were observed in the lying-in department of the Rigshospital in Copenhagen. Of 21 children only 10 were discharged from the hospital alive. Six were stillborn with third degree maturation; 2 were excessively large and died during delivery and 3 died in the first days after birth. Two of the last group were born prematurely. In no case was hypoglycemia proved to be a cause of death. The high infant mortality may probably be attributed to maternal hyperglycemia and acidosis. In 3 instances changes observed at necropsy in the pancreas, hypophysis and thyroid are described.

No clinical evidence was found of any permanent change in the severity of the maternal diabetes as the result of pregnancy. Acidosis was frequent and variations in insulin dosage were necessary but these were temporary and ascribed to exogenous factors. Comatose conditions or coma appeared in 6 of the 22 women. Phenomena of insulinism were observed in 13 patients not infrequently in connection with hyperemesis and a lowered state of nutrition. The insulin requirement decreased in 6, increased in 4 and remained unchanged in 8 patients; no insulin was given in 4 instances.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Cutler, H. H., Power, M. H., and Wilder, R. M.: Concentrations of Chloride, Sodium, and Potassium in the Urine and Blood: Their Diagnostic Significance in Adrenal Insufficiency. *J. Am. M. Ass.*, 1938, 111 117

Under standardized conditions the concentration of either chloride or sodium in the urine is more significant in the diagnosis of Addison's disease than is the volume of the urine, the concentration of potassium in the urine, or the values or change in values of the chloride, sodium, or potassium of the blood plasma. This conclusion is based on the examination of 17 patients suffering from Addison's disease and 37 controls, of whom 10 were healthy persons and 27 were patients suffering from diseases which apparently did not involve the adrenal glands.

The procedure for the diagnostic examination is as follows:

If the patient has been receiving either cortin or extra salts of sodium, these are withheld for a day before the examination. Throughout the examination the patient is given a diet that is low in salt, which contains 0.95 gm. of chloride ion, 0.59 gm. of sodium, and 4.1 gm. of potassium. On the first day the drinking of water is encouraged. On the afternoon of the first day 42 mgm. of potassium citrate per pound of body weight are given. On the second day the intake of liquid is made to equal 40 c.c. per kilogram of the body weight. On the morning of the second day the dose of potassium citrate is repeated. On the third day 20 c.c. of liquid per kilogram of body weight is given before 11 a.m. At noon of the third day the examination ends. At the close of the examination, all patients in whom adrenal insufficiency is suspected are given an intravenous injection of 1,000 c.c. of sterile solution containing 50 gm. of *D*-glucose, 10 gm. of sodium chloride, 5 gm. of sodium citrate, and 20 c.c. of an active preparation of cortical hormone. The constituents of this solution are held ready at all times for immediate use, if necessary. The concentration of chloride in the urine collected from 8 o'clock in the morning to 12 noon, of the third day is determined. A concentration in excess of 225 mgm. per cent indicates some abnormality of the adrenocortical function, whereas a concentration of less than 125 mgm. per cent can probably be accepted as evidence of normality. Concentrations between these two figures are inconclusive and a longer period of restricted intake of salt may be necessary for diagnosis.

Complicating organic disease, especially uncontrolled diabetes or some forms of nephritis, may make this test inapplicable for the diagnosis of Addison's disease. The examination of patients must not be undertaken unless rest in bed, or at least in

the patient's room, is enforced, unless continuous nursing attention is provided, and unless facilities for the immediate intravenous injection of sodium chloride, sodium citrate, and cortical hormone are at hand in the event of emergency.

This test requires less time, subjects the patient to less risk of collapse, and, in most cases, is quite as informative as the six-day period of restricted intake of salt heretofore resorted to for diagnostic purposes. A further advantage is that the determination of concentration is a much simpler procedure for chloride than for sodium or potassium.

Walters, W., and Kepler, E. J.: Adrenal Cortical Tumors and Their Treatment. *Ann. Surg.*, 1938, 107 881

The histories of 7 consecutive patients from whom adrenal cortical tumors were removed at the Mayo Clinic between 1932 and 1937 are presented. All 7 patients showed in varying degrees the signs and symptoms known as the "adrenal cortical syndrome." The patients were all female and ranged in age from twenty-three months to thirty-nine years. All recovered from the operation. In 5 of the patients the removal of an encapsulated tumor produced prompt regression of the symptoms and there has been no recurrence of the tumor during periods of observation ranging from two months to five years. In the 2 other patients the carcinomatous tumor had penetrated the adrenal capsule and within a period of eighteen months after its removal it had recurred with fatal consequences.

Since most adrenal cortical tumors producing the syndrome are relatively malignant, but in the early stages are definitely encapsulated, it is important to make the diagnosis early and to remove the lesion before the cells have penetrated the capsule and invaded adjacent structures. The similarity of the clinical syndrome produced by an adrenal cortical tumor to pituitary basophilism may lead to the erroneous decision that the latter is present. In view of the facts (1) that treatment of pituitary basophilism is entirely dependent on roentgen therapy, from which, in a very few cases, little more than palliative benefit has been obtained, (2) that adrenal cortical tumors are frequently the cause of a similar syndrome, and (3) that the removal of these tumors can usually be readily accomplished, Walters and Kepler believe that the adrenal gland should be explored if patients present this syndrome, provided that their condition permits.

Symptoms produced by an adrenal cortical tumor depend on the sex and age of the patient at the time the tumor begins to function. These tumors occur most often in women and produce variable changes in secondary sex characters, such as cessation of menstruation, occasional hypertrophy of the clitoris, and abnormal growth of hair with masculine dis-

tively and inasmuch as the percentage saved was inversely related to the amount of blood loss, the maximum saving did not amount to an ounce and a half.

7 The complications of the third stage of labor were about equally distributed in both series of cases.

The effective control of post partum blood loss is the result of careful management of the third stage of labor based on a thorough knowledge of the physiology and pathology involved. The prophylactic administration of solutions of the pituitary body is not productive of more disturbance, and appreciably reduces the blood loss in hemorrhages due to uterine stony only.

EDWARD L. CORNELL, M.D.

Baumann, T. Investigations on the Vitamin C Metabolism in Lactating Women and on the Grade of the Physiological and Pathological Vitamin C Saturation of the Human Organism (Untersuchungen ueber den C-Vitaminstoffwechsel bei lactierenden Frauen und ueber den Grad der physiologischen und pathologischen C-Vitaminanreicherung des menschlichen Organismus). *Jahrb. f. Kinderh.* 1937 150 193.

With a sufficient saturation with Vitamin C in lactating women, 50 per cent of the vitamin is excreted in the milk and urine after an administration of 100 mgm. of ascorbic acid. If the milk values of Vitamin C are about 1.5 or 4 mgm. per 100 c.cm. they indicate a well saturated organism. The milk content of Vitamin C stands in direct relationship to the Vitamin C concentration in the blood during the fasting state. Blood values below 0.8 or 1.0 mgm. per 100 c.cm. of ascorbic acid show a poorly saturated organism, whereas blood values above 1.4 mgm. per 100 c.cm. indicate a well saturated organism. In women in whom lactation is terminating the percentage of the Vitamin C content increases and the more saturated the organism the greater the percentage becomes. With an increasing secretion of milk the percentage of the ascorbic acid content does not diminish and therefore the daily excretion of Vitamin C increases. There is therefore in saturated lactating women a parallelism between the amount of milk and the daily excretion of Vitamin C.

With a relative Vitamin C deficiency of the organism these relationships are altered. There is a

lower content of Vitamin C in the colostrum as an expression of the immaturity of the breast gland without relationship to the Vitamin A saturation of the particular woman.

The amount of Vitamin C excretion in the urine depends upon the amount of the vitamin in the blood. Its excretion results only when the blood value is over 1 mgm. per 100 c.cm. This does not apply to the breast gland. Even with maximal saturation of the organism with Vitamin C the Vitamin C concentration in the milk does not increase to more than from 7 to 8 mgm. per 100 c.cm. The lactating organism is capable of storing the Vitamin C. Twenty per cent of the amount of Vitamin C administered is used up by the lactating woman in her metabolism. With equal saturation and equal amounts of milk (individual differences in the Vitamin C concentration of the milk can be found).

The Vitamin-C requirement of lactating women is estimated at 50 mgm. per day. For wet nurses and the mothers of twins the requirement is correspondingly higher. The Vitamin C content of human milk shows certain seasonal variations with low values in November and December. The Vitamin C requirement of infants lies between 8 and 17 mgm. per day. A single administration of Vitamin C is not sufficient for the determination of the degree of saturation, a more distinct picture is obtained with an additional administration of 100 mgm. per day. The physiological degree of saturation of the organism varies between wide limits and lies between a test dosage of from 0 to 40 mgm. per kilogram of body weight (the test dosage is the number of milligrams of ascorbic acid that must be administered until a distinct increase is demonstrable in the urine—Widenbauer). Only with a test dosage of over 40 mgm. can a hypovitaminosis be spoken of. There is a parallelism between the fasting blood content of Vitamin C and the degree of Vitamin C saturation of the organism. The physiological range lies between 0.4 and 2.45 mgm. per 100 c.cm. of blood. The disappearance of pathological phenomena by the administration of Vitamin C does not always depend upon the presence of a hypovitaminosis. Individual details should be read in the original.

(ZIEGLER) LOUIS VERNET, M.D.

as such, 2 were found to be free from kidney involvement after repeated investigations, 1 was traumatic in origin, and 9 were investigated with hopeless inadequacy.

The author discusses the route taken by the tuberculous bacilli in reaching the epididymis and considers the blood stream, the urinary stream, and the lymphatics. He contends that the kidney is involved through the blood stream because of a primary focus elsewhere in the body. The infection then descends to the bladder by the urinary stream and from the posterior urethra to the epididymis by way of the lumen of the vas. He further states that the lymphatics can definitely be excluded as a route of infection because of their distribution.

Relative to the blood stream's being the route by which the infection reaches the epididymis, the author makes the statement that "in blood stream infection as in mumps, etc, it is the body of the testicle and not the epididymis that is usually affected." Furthermore, the vascular supply to the testicle does not favor the constant selection of the epididymis. He further states that renal lesions heal, while the local infection of the epididymis may continue. The practical importance of this theory is that when a definite diagnosis of tuberculous epididymitis has been made, it is imperative that careful observation of the patient be made to determine the presence of destructive renal tuberculosis.

The author makes the following statements with regard to the care of patients with tuberculous epididymitis:

"1 Tuberculous epididymitis is a certain sign of renal tuberculosis and demands full and repeated renal investigation.

"2 The presence of tubercle bacilli even with blood and pus in the specimen segregated from one kidney does not damn that kidney out of hand. A destructive lesion must be demonstrated by pyelography before a diagnosis of surgical renal tuberculosis is justified.

"3 A demonstrable lesion never heals and a nephrectomy should be done.

"4 Back pressure changes caused by fibrosis of the bladder wall around the ureter of the healthier kidney may be misleading and may lead to an unwarranted diagnosis of bilateral disease.

"5 Nephro-ureterectomy is the operation of choice in cases in which the affected ureter is dilated

due to obstruction at its lower end. These are the cases most likely to cause a persistent fistula.

"6 Epididymectomy is the operation of choice in tuberculous epididymitis. Carefully performed, it is a successful operation even in quite advanced cases with sinuses. It may, however, be impossible; e g, the whole organ may have sloughed away. It is because of the risk of this occurrence as a sequel on the healthy side that epididymectomy is so important.

"7 The vas on the healthy side may be ligated and divided in certain circumstances. This operation prevents contra-lateral involvement and should be done, with the consent of the patient, (a) in old age, (b) when one testicle has been completely lost or needlessly sacrificed, and (c) in the presence of frank prostatitis and vesiculitis. It should not be done in young patients with a good general prognosis.

"8 In the absence of epididymitis, vasotomy is reasonable, e g, one vas might be divided to protect one testicle and its fellow might be left to provide external secretion and take a risk! I should not, however, be prepared to advocate this measure.

"9 I have no experience of the radical excision of the vas and vesicle and have no reason to disagree with the opinion generally held in this country that it is an unnecessarily severe operation in the majority of cases."

J SYDNEY RITTER, M D.

MISCELLANEOUS

Farrell, J. I.: The Secretion of Alcohol by the Genital Tract. *J Urol*, 1938, 40 62

The author has made a very careful study of the effect of alcohol on the genital organs of dogs.

The experimental data show that alcohol is eliminated by the prostate gland and, to a lesser extent, by the testicle. The motility of the sperm stops more quickly in alcoholic animals, the higher the concentration of the alcohol, the more quickly the motility of the sperm ceases. The concentration of the alcohol excreted by the prostate gland is very similar to that excreted in the urine. Since it has been shown that alcohol is deleterious to the diseased kidney, it would likewise appear to have a deleterious effect on the diseased prostate gland. The harmful action of alcohol in prostatic diseases, such as prostatitis and prostatic hypertrophy, is seen by all who have treated such diseases.

J SYDNEY RITTER, M D

tribution. Among girls tumors of the adrenal cortex tend to produce precocious puberty, more masculine than feminine in character. The disease seldom occurs among males either young or old. Other common symptoms are a florid complexion, purplish striations of the skin, acne, hypertension, diabetes (either chemical or latent), osteoporosis, weakness, and a gain in weight. Unfortunately for diagnostic purposes there is much variation in the symptoms.

Hyperplasia of the adrenal cortex, which is sometimes associated with tumors of the thymus, may produce a clinical picture almost if not entirely identical with that seen in cases of pituitary basophilism or adrenal cortical tumor. Furthermore masculinizing tumors of the ovaries (usually arrhenoblastoma, rarely granulosa-cell tumors) result in hirsutism of the male type, amenorrhea, and hypertrophy of the clitoris. However, such tumors practically never cause diabetes, hypertension, or osteoporosis. In children tumors or inflammation in the region of the pineal body may produce sexual and somatic precocity. Finally many women have varying degrees of hirsutism, amenorrhea, hypertension, or obesity for which no adequate basis can be found. Since pituitary basophilism rarely occurs in children, the difficulty of differentiating it from an adrenal cortical tumor occurs chiefly in the cases of young women.

Routine laboratory studies have been of little aid in the differential diagnosis, although a high content of estrogenic substance in the urine suggests adrenal cortical carcinoma, provided that pregnancy is excluded. Injection of air about the adrenal gland has been of aid in localization of some adrenal tumors.

In 40 cases reported in the literature the surgical mortality rate was 47 per cent. In the opinion of Walters and Kepler the absence of mortality in the 7 consecutive cases which were operated upon at The Mayo Clinic is attributable to an increased understanding of the disturbance of physiological processes which follows removal of almost all hyperfunctioning tumors of the endocrine system and to an increased knowledge of the pathological physiology of Addison's disease. Improved methods of treating acute adrenal insufficiency have thereby been developed. These consist primarily of the administration of large quantities of sodium chloride and sodium citrate, daily administration of an adequate amount of cortical hormone, and of a low potassium diet throughout the postoperative period. The patient should be kept under the closest supervision not only during the first few hours after operation but until his complete recovery. Insufficiency of the adrenal cortex may at first be so mild in its clinical characteristics as to escape detection. Among the more important of the premonitory signs of acute adrenal failure are anorexia, hiccup, nausea, vomiting, weakness, insomnia, apathy, restlessness, an increasing pulse rate, and a falling blood pressure. Pyrexia accelerates the development of adrenal insufficiency and is therefore poorly toler-

ated. The clinical manifestations may precede any material change in the chemical composition of the blood. The blood pressure should be recorded every four hours and analyses of the blood for its content of sugar, chlorides, and urea should be made daily. If at any time the condition of the patient is in any way suggestive of adrenal insufficiency, more vigorous treatment should be instituted or treatment should be resumed if it has been discontinued. It is not generally appreciated that fatal adrenal failure can develop within a few hours. Danger lies in under-treatment rather than in over-treatment.

In the opinion of Walters and Kepler the surgical approach to the adrenal glands which gives the best opportunity for minute and careful inspection of the glands is through a posterolumbar incision similar to that used for exposure of the kidney. After the fascia of Gerota has been incised the perirenal fat is reflected from the upper pole of the kidney and the kidney is retracted downward, thus exposing the posterior aspect of the adrenal gland. In this way it can be studied accurately from every side without disturbance of the circulation. Care is taken to prevent injury to the blood vessels which enter the adrenal gland on its mesial and inferior aspect.

Although Walters and Kepler have seen 1 case of minute multiple adenomas, in other cases adenomas have been recognized grossly with ease. They have varied from 2 to 15 cm. in diameter. When larger tumors are present practically the entire adrenal gland is thinned out and destroyed, with the exception of a fringe a few millimeters long which can be recognized by its brilliant yellow color as being adrenal cortical tissue. The right adrenal gland is in direct contact with the inferior vena cava. Usually the blood vessels supplying an adrenal tumor are much larger than those which supply the normal gland. On this account care must be taken to ligate them accurately.

GENITAL ORGANS

Wells, C. A. Tuberculous Epididymitis. *Brit J Urol* 1938 10 114

The author presents the subject of tuberculous epididymitis with the hope of proving that tuberculous of the epididymis does not occur unless a primary focus of the genito-urinary tract is present in the kidney.

He quotes Medlar, Coulson, Band, and others, and states that renal tuberculosis will heal. He bases his conclusions on the clinical findings of 55 cases of tuberculous epididymitis.

Of 31 personal patients with tuberculous epididymitis, 24 had destructive renal lesions, 3 had no evidence of a destructive lesion after full investigation, 1 had inconclusive evidence after a long period, 1 had evidence suggesting a healed lesion, and 3 were investigated with hopeless inadequacy.

Of the remaining 23 patients (i.e. not personal cases), 7 had frank renal lesions, 4 had good evidence of renal lesions, but the lesions were not diagnosed.

Dawson, E. K., Innes, J. R. M., and Harvey, W. F.: *Debatable Tumors in Human and Animal Pathology V. Giant-Cell Tumor of Bone.* *J Laryngol & Otol*, 1938, 53 491

The giant-cell tumor of bone is highly cellular, essentially an osteogenic tissue growth, characterized in its typically active form by the presence of numerous discrete multinucleated giant cells in the midst of much more numerous polyhedral or fusiform cells. The tumor may recur, but it so rarely develops into a malignancy with metastases that it may be regarded as practically benign.

Giant-cell tumor of bone is a neoplastic growth, probably originating with trauma and hemorrhage and developing as an osteogenic tissue reaction and proliferation, which may slowly progress and ultimately regress, but which, in rare cases, acquires the characteristics of an osteogenic sarcoma. It may be classed as a type of new growth intermediate between purely reactive tissue and true blastoma.

Trauma is an important causative agent of the growth of giant-cell tumors. These tumors are constantly associated with hemorrhage, which is followed by a characteristic neoplastic reaction of the osteogenic cellular tissues and vessels. This reaction is of a progressive nature, although it usually shows some regressive or reparative changes in the collagenous fibrocystic tissue in the form of cyst and bone formation, and in the disappearance of the multinucleated cells. The giant cells are produced by fusion of small primitive osteogenic tissue cells which are osteoclastic. An active giant-cell tumor of bone is a bone resorptive growth, but new osteoid bone is produced. This new bone is not wholly the result of a reaction of the periosteum which forms a crepitant capsule to the expanding tumor because bone is frequently found in the midst of the growth.

Regression means fibrosis, bone formation instead of bone absorption, and disappearance of the giant-cells, a histological picture which may give rise to errors in the diagnosis.

The diversity of views seems to be best unified if one regards the more primitive component cell types of the tumor as fibroblast, reticuloblast, angioblast, lipoblast, chondroblast, osteoblast and osteoclast, respectively, which proliferate continuously, though in a varying degree, and take origin in a mesenchymal cellular primordium. The prototype cell is the primitive pluripotential cell, with determination to a type of growth represented by fibroplasia, angiopoiesis, lipopoiesis, chondroplasia, osteopoiesis, and osteoclasts. The vascularity of these tumors is of a sinusoidal and cavernous type, and is analogous to that found in bone marrow.

A phase of the giant-cell tumor may initiate the ordinary osteogenic sarcoma but the change is rarely observed microscopically. Embryological mesenchymal and epithelial tissues persist as a residue in adult tissue. This residue tissue has all the potentialities of differentiation and is responsible for the production of granulation, reparative, and tumor tissues. The persistence of this embryological

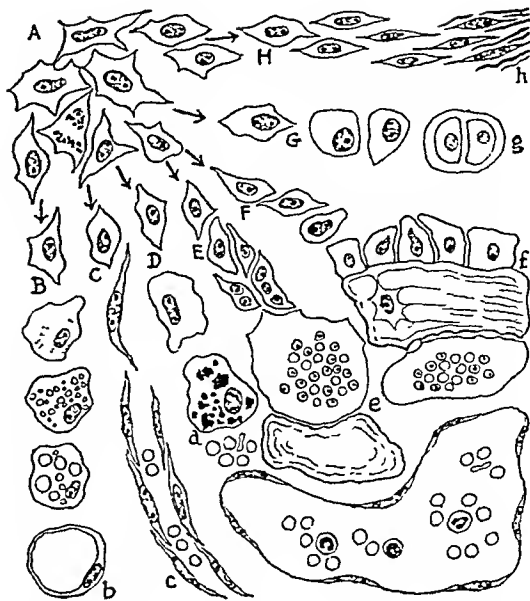


Fig 1 Showing various stages of the "determination" of the primitive mesenchyme cells from which recognizable giant-cell tumor elements are derived. Primitive mesenchyme, A, lipoblast, B, to lipocyte, b, angioblast, C, to angiocyte (intimal endothelium), c, reticuloblast, D, to reticulocyte (macrophage), d, "pre-osteoclast," E, to osteoclast, e, absorbing bone, osteoblast, F, to osteocyte, f, forming bone, chondroblast, G, to chondrocyte, g, fibroblast, H, to fibrocyte, h, with collagen fibres. Haemocyto-blast to myeloid blood cells not indicated.

residue is greatest in the epiphyseal and metaphyseal regions, a fact which may explain the more frequent occurrence of solitary giant-cell tumor in adolescents and young adults in these locations.

The giant-cell tumor of bone is regarded as a simple reaction and a true tumor of benign character. Interference or any other disturbing condition may be a factor in the development of greater cellularity and neoplastic activity, with ultimate malignancy and metastasis.

Specimens from 117 cases of bone tumor served as the basis of this report. Forty-five photomicrographs and explanatory captions are presented.

ROBERT P. MONTGOMERY, M D

Barr, J. S.: *The Relationship of the Intervertebral Disc to Back Strain and Peripheral Pain (Sciatica)* *Surgery*, 1938, 4 1

Intractable low back and sciatic pain is frequently due to the mechanical pressure of tissue of the intervertebral disc protruding posteriorly into the lumbar spinal canal and impinging on one or more roots of the cauda equina which go to form the lumbosacral plexus.

There are no physical, neurological, or orthopedic signs which are found only in cases of protrusion of

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

De Langre and Cretin Spontaneous Fracture in Osteomyelitis Simulating Sarcoma (Fracture spontanée par ostéomyélite imitant un sarcome) *Ac d'orthop* 1935 5 320

A case of osteomyelitis of the left femur which had been diagnosed as an osteo sarcoma is presented from the clinical medicolegal and anatomical viewpoints

Clinical A forty year old man was sent to the hospital with the diagnosis of osteosarcoma of the left femur with spontaneous fracture About five weeks previous the patient had twisted his left knee and had been confined to bed since the accident His temperature had been within normal limits There was a light swelling on the lateral aspect of the thigh and knee

When he entered the hospital examination revealed considerable deformity of the thigh due to the fracture and a hard tumor with no signs of inflammation The skin displayed a network of dilated vein over the tumor The patient was quite anemic The roentgenograms affirmed the presence of the tumor and fracture The patient was prepared for operation a biopsy of the tumor was taken and no malignancy was found Nevertheless a disarticulation of the left hip was performed The patient died very suddenly seven days following the operative procedure

Medicolegal The possibility that the acute osteomyelitis had been caused by the original accident must be considered In this case the court affirmed that the accident aggravated the osteomyelitis which may have been present previously and which was responsible for the patient's present condition His toxicological examination was in favor of an old infection There is the possibility that an old osteomyelitis may be capable of remaining latent for months and even years It would be impossible to state exactly what the evolution of that osteomyelitis may have been without the accident The condition which possibly had already been present was aggravated and hastened the evolution of the fatal osteomyelitis The legal accidental origin establishes the reality of the accident and the continuity of the troubles

Anatomical The bacteriological examination revealed definite peculiarities in this case of spontaneous fracture which differentiated it from cases of acute osteomyelitis The staphylococcus pyogenes aureus was the offending organism

Histological examination revealed that the femoral head and knee were entirely normal Further examination showed a regular morphology indicative of reconstruction Histochemically the albumins did not have the metachromatic character of young

bone There was no sequestration present as is seen in acute osteomyelitis

RICHARD J BENNETT JR MD

Larsen R M Intramedullary Pressure with Fascular Reference to Massive Diaphyseal Bone Necrosis *Ann Surg* 1935 103 127

The author suggests the hypothesis that massive necrosis of acute suppurative osteomyelitis may be due to ischemia caused by increased intramedullary pressure the effect of which is enhanced by the rigidity of the walls of the medullary cavity and the close interdependence of volume blood flow and pressure which this anatomical characteristic implies He presents several series of experimental studies of intramedullary pressure made with the use of a threaded steel cannula inserted into the medullary cavity In normal dogs he finds that the relationship of arterial pressure to intramedullary pressure is approximately 3 to 1 and the intramedullary pressure changes parallel the changes in the arterial pressure The intravenous injection of a dye produces a small rise in the intramedullary pressure simultaneous with an abrupt elevation of the arterial pressure but the intramedullary pressure then drops precipitously and remains low during the period of elevation of the arterial pressure gradually rising to its base level as the arterial pressure returns to normal The injection of pituitrin causes a similar change Ephedrine produces a prolonged increase in the intramedullary pressure while histamine produces a small decrease These results are what one would anticipate when dealing with a vascular network enclosed in rigid walls

The author then describes a series of experiments in which elevation of the intramedullary pressure was produced by physiological saline solution He found that pressures below 75 cm of salt solution for from twenty four to forty eight hours do not lead to bone necrosis even in the presence of gross infection but that medullary infusion of normal saline solution at pressures of 180 cm or more for twelve hours or over produces massive bone necrosis followed by massive sequestration in bones with unfused epiphyses and widespread reabsorption in bones with closed epiphyseal lines

He concludes that increased intramedullary pressure may be of extreme importance in the production of massive bone necrosis and suggests that sequestration of dead bone occurs only when there has been complete destruction and long continued exclusion of the vascular connections between the bone and the surrounding vascular tissue Therefore the fundamental principle in the treatment of acute suppurative osteomyelitis is the early release of pressure in the infected bone before the bone is killed in order to avoid massive necrosis and subsequent sequestration DANIEL H LEVITZKY MD

The authors found that involvement of the spine in Hodgkin's disease, lymphosarcoma, and leucemia simulated metastatic carcinoma. These lesions were found to be rare in their series. They stressed that these multiple lesions of the spine in adults must be differentiated from multiple myeloma, which produces rarefied circular defects with a tendency toward pathological fracture and collapse.

Benign giant-cell tumors and osteochondromas were found to be the most common benign tumors of the spine. Giant-cell tumors affected the spine of young adults below the cervical spine, and tended to involve the neural arch and produce trabeculated lesions outside of the body of the vertebra. In spite of the fact that it is a benign tumor, 4 of the 14 patients died because of damage to the cord and invasion of the inferior vena cava with resulting hemorrhage. The authors found 2 cases of atypical solitary cyst of the spine. They felt that the absence of typical bone cysts in association with tumors of the spinal column lent support to the opinion that bone cysts of long bones were the healing phase of giant-cell tumors. Multiple involvements of the spine, with bone atrophy and cyst formation occurred as a part of the syndrome of generalized osteitis fibrosa. There were 10 cases of osteochondroma which was found to involve any portion of the spine. Only 2 cases of hemangioma were found in this series, both producing the characteristic vertical striations. The rarity of this lesion is probably due to the fact that hemangiomas of the spine are not invasive and do not grow rapidly as a rule, and therefore they may be present in many cases without producing symptoms.

Malignant primary tumors were less common than benign growths. These included chondrosarcoma, osteolytic sarcoma, and sclerosing sarcoma. In several cases they were found to be secondary to multiple exostoses or Paget's disease. Chondrosarcoma occurred in all portions of the spine, tended to involve several vertebrae, and produced characteristic calcified paravertebral shadows. There were 8 cases of sarcoma, 4 osteolytic and 4 sclerosing types. The roentgenograms in the cases of the sclerosing type showed irregular formation of new bone in the soft parts. Osteolytic sarcomas were less characteristic and produced rapidly extending bony destruction, with infiltration of the soft parts. Chordomas were found in 5 cases. These involved either the spheno-occipital or the sacrococcygeal region of the spine of the adult and produced a slow-growing but malignant bone destructive lesion, which increased in size gradually over a period of months or years. This tumor kills by the invasion of vital structures.

Rix and Geschickter discuss 12 cases of undifferentiated neuroblastic tumors, sympathicoblastomas, involving the spine. These tumors usually involve the lower thoracic and lumbar spine, destroy bone, and produce a paravertebral shadow. They tend to metastasize to the regional lymph nodes and to other bones. They resemble the Ewing

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There is a very good bibliographical review plus a report of 7 personal cases from the Istituto Rizzoli of Bologna.

Of the 7 cases, 5 were treated by linear supracondylar osteotomy and 2 of these were followed by a recurrence of the deformity. In each of the remaining 2 cases a cuneiform osteotomy was done.

The author concluded that correction during the growing ages is followed by a high percentage of recurrences. The best results followed supracondylar cuneiform osteotomy. It is advisable to wait until the epiphyses have fused before the operation is performed. If this is not possible, repeated check-up with the roentgen-rays and exact measurements should be made and operation performed only when there is no longer an increase in the deformity.

CARLO SCUDERI, M.D.

Bunnell, S.: Opposition of the Thumb. *J. Bone & Joint Surg.*, 1938, 20, 269.

The term "opposition" implies opposite and far apart. The thumb to be in true opposition must not only be opposite the fingers and far forward from them but it must also be diametrically opposite to them by rotation, that is, with the pulp of the thumb facing the pulp of the fingers and with the thumb nail parallel to the palm.

The various parts of the act of opposing the thumb are described in detail.

The loss of opposition of the thumb results from loss of nerve function to the muscles of the radial half

the intervertebral discs. All of the known signs may be found in other conditions. Yet, the symptoms and signs of a ruptured lumbar intervertebral disc are so constant and characteristic that a presumptive diagnosis can often be made before lipiodol roentgenographic studies are made.

Probably from 90 to 95 per cent of the patients who have sciatica recover either spontaneously or after conservative treatment and do not need to be subjected to the highly technical and possibly dangerous lipiodol examination.

It is only when sufficient disc material is displaced posteriorly into the canal to cause one or more roots of the cauda equina to be pinched that symptoms arise. Many patients with this lesion are relieved by conservative measures. The author has under observation a patient with a disc lesion proved by lipiodol examination who is perfectly comfortable if the spine is immobilized in a back brace or a plaster jacket, but who is incapacitated by severe pain if the support is removed. Unless there is evidence of neurological changes due to pressure on the nerve roots, adequate prolonged conservative treatment such as is used for any back strain should be insisted upon before a lipiodol examination is recommended. A ruptured intervertebral disc can not be ruled out in any given case except by lipiodol roentgenographic study, done with the proper technique.

A ruptured intervertebral disc may cause sufficient pressure on the cauda equina to produce obvious paralysis and anesthesia, but the majority of these cases have protrusions so located and of such size that only one nerve root is pressed upon and the only symptom is referred pain, all objective neurological signs being absent. A negative neurological examination cannot be accepted as proof of the absence of this lesion. Also it cannot be accepted that a given case is a classical picture of lumbosacral or sacroiliac strain.

Arachnoiditis characterized by matting together of the roots of the cauda equina may cause intractable low back and sciatic pain which is usually bilateral. Subarachnoid hemorrhage following trauma may produce the same symptoms. A lumbar puncture if done in the area of fibrosis will show the dynamic alterations of a complete or incomplete block or it may be impossible to obtain fluid unless the needle is inserted at a higher level. The lipiodol examination is not characteristic, but an incomplete very irregular slow filling or a block with an irregular margin is usually noted.

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Laminectomy without removal of the protruding mass of disc tissue might relieve the symptoms by taking away one limb of the 'nut-cracker' which is pinching the nerve root. Spine to wit it does in a pain free interval might prevent the recurrence of symptoms and, indeed has probably been done many times on unrecognized cases of lesions of the intervertebral disc. Laminectomy and removal of the ruptured, protruding portion of the disc is the logical treatment for this condition if conservative non-operative methods fail. The question of whether an attempt should be made to strengthen the spine by fusing the area of laminectomy is still unsettled. If the laminectomy leaves all articular facets intact the spine is probably little weakened but if a facet is removed, fusion is indicated to prevent symptoms of a weak back. It is technically difficult to fuse a spine after laminectomy. The author has used a flexible osteoperiosteal tibial graft to bridge the osseous defect, has laid multiple bone chips over the graft, and has destroyed the articular facets by curettage. Nursing care is simplified if a plaster shell is made preoperatively. The patient is allowed up with his back supported by a brace or a plaster jacket after six or eight weeks of recumbency. Heavy lifting should be avoided for six months.

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Metastatic carcinoma, usually from the breast or prostate gland was the most frequent neoplastic lesion of this series. Carcinoma of the breast showed no predilection for any part of the spine and usually produced multiple osteolytic lesions although some were osteosclerotic. Carcinoma of the prostate gland involved the lumbar spine and sacrum as a rule and produced sclerotic of bone. The primary focus of the cancer in some cases remained undiscovered until the post mortem examination. In other cases the primary lesion had been discovered and removed from ten to fourteen years prior to the occurrence of the spinal lesions.

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of the thenar eminence or loss of these muscles themselves or it may be due to carpal contracture from infection which approximates the first two metacarpals to adhesions which hold back the tendon of the exten or pollicis longus or to flat hand from faulty splinting or from ankylosis of the intercarpal and carpometacarpal joint. The act of opposition can often be restored if the causes are recognized and repaired.

When the nerve or thenar muscles are irreparable and mobilizing operations if necessary have been done then tenoplasty by tendon grafting will restore good opposition if two major principles are followed. The principles are that the tendon must pull subcutaneously in the direction of the pisiform bone, and it must be inserted in the dorso-ulnar aspect of the base of the proximal phalanx of the thumb to give opposition. To make the tendon pull toward the pisiform bone either a tendon pulley is constructed there or the tendon is looped around the distal part of the tendon of the flexor carpi ulnaris. It is important that the tendon does not pass under the transverse carpal ligament as this merely pulls the thumb into the palm. There are various muscles which can be used for motor power such as the flexor carpi ulnaris, the palmaris longus, the flexor digitorum sublimis of the ring finger, or any long flexor muscle. The tendon of the exten or pollicis brevis is ideal to be drawn subcutaneously across the palm as it has the correct insertion into the dorso-ulnar portion of the thumb and can be attached to one of the tendons mentioned for motor power.

The article is supplied with photographs and illustrations of the principles involved.

HARVEY S. ALLEN, M.D.

Ober, F. R. The Relation of the Fascia Lata to Mechanical Disabilities of the Spine. *Surgery* 1938, 4, 21.

A detailed discussion of the mechanical relationship of the lower extremities to the trunk and the effect of abnormal contractures of muscles and fascia of the lower extremities on the spine are presented.

Fascial contractures occur at the junction of the thigh and pelvis. Limitation in raising of the straight leg, forward flexion of the spine, prone knee flexion or in extension and adduction at the hip joint is a sign by which fascial contractures at the junction of the thigh and pelvis can be demonstrated. Detailed descriptions of these signs and other tests are given.

When the iliotibial band is contracted all the anterior fascial connections are contracted and they produce flexion of the pelvis on the femur. The sacrum becomes more horizontal and the physiological curves of the spine are increased. In many cases of severe lame back of long duration the persistent lumbar lordosis may be due to shortening of the interspinous ligaments and contractures of the lumbar fascia. A release of the contracted thigh fascia allows the lordosis to disappear rapidly and without symptoms in the mobile lumbar spine. In the fixed lordotic spine the curve disappears slowly and is attended by symptoms of low back strain as the result of irritation at the bony attachments of the lumbar fascia and interspinous ligament, from mechanical stretching.

Poor postures and lame backs are more promptly relieved if fascial contractures are disposed of early. The treatment of mechanical difficulties of the back which are associated with fascia lata contractures consists of first removing or decreasing the contractures and then securing a return of the spine to a normal physiological position. The deforming factors must be removed because the deformity increases the burden on the musculature that is trying to maintain a posture against a contracture.

The contractures may be relieved by conservative or operative methods or a combination of both. Rest in bed, rest plus local immobilization, traction, fixation in a plaster spica and physical therapy are employed in the treatment whenever indicated. Indications for specific conservative and operative therapy and a description of the operative technique and postoperative care are given.

Indications for the operative relief of fascial contractures are meralgia paresthetica, sciatica of long standing, sciatica plus lame back, chronic lame back, unsuccessful lumbosacral fusion and failure of fasciotomy on the opposite leg.

Operative treatment should be postponed until all other conservative measures have failed. Fasciotomy is a relatively simple operation but its usefulness is limited to a selected group of cases.

There is a definite relationship between lame backs and sciatica in some cases. The author emphasizes, however, that it must not be assumed that contracted fascia are responsible for all cases of lame back and sciatica and that a proper diagnosis must be made before the fascia lata and iliotibial bands are divided.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Laubry, C., and Louvel, J. • Stokes' Law in Venous Pathology (La loi de Stokes en pathologie veineuse). *Presse méd.*, Par., 1938, 46 505

According to Stokes' law inflammation of a serous membrane produces paralysis of the adjacent muscle. This law has been applied particularly to the intestinal tract, but Laubry and Louvel maintain that it can also be applied to the venous system. There is a close resemblance between the structure of the intestinal and that of the venous walls. Recent studies have shown that the outer coat of the veins is, in fact, a serous membrane. If this is so, pathological changes in this serous coat should cause a paralytic inhibition of the function of the muscular coat according to Stokes' law. Actual pathological conditions confirm this logical deduction. In particular the authors discuss subacute and chronic periphlebitis, venous changes in gout, and hemorrhoidal rectitis.

In recurrent attacks of periphlebitis, the initial attacks are characterized by inflammation of the outer tunic of the veins and of the neighboring tissues. There is an enlargement of the affected veins, due to loss of tonus of the muscularis, but as the inflammation subsides, the muscularis regains its tonicity, and the veins become normal in size. It is only when attacks have recurred repeatedly, that the return of muscular tonus is not complete and the veins become permanently dilated. In the earlier stages, the pathological changes in the venous walls follow the Stokes' law.

In attacks of gout, the outer coat of the veins in the region affected is involved, as gout characteristically attacks serous membranes primarily. This results in dilatation and loss of tone of these vessels, which is one of the characteristic symptoms of gout. This condition subsides with the acute attack, showing that the dilatation and atony of the veins are due to the temporary paralysis of the muscularis resulting, according to Stokes' law, from the inflammation of the outer coat.

Hemorrhoids are associated with inflammation of the mucosa and submucosa of the rectum, and in the opinion of the authors, this inflammation is the primary condition, inflammation of the outer coat of the veins being secondary. In accordance with Stokes' law, the inflammation of the outer coat of the vein results in atony of the muscularis, with hemorrhoidal dilatation.

ALICE M. MEYERS

Kaplan, T.: Thrombosis of the Axillary Vein. Report of 5 Cases, with Comments on Etiology, Pathology, and Diagnosis. *J Am M Ass.*, 1938, 110 2059

The author notes that, although thrombosis of veins is common in the pelvic region and in the lower

extremities, in the veins of the upper extremities it is not common. Thrombosis of the axillary vein caused by trauma from effort is comparatively rare. An extensive review of the literature is presented. Five cases of thrombosis of the axillary vein in males were observed by the author and the report of his findings is given in detail.

The theory is advanced that as a result of sudden stretching and compression of the axillary vein, localized phlebitis follows, which in turn leads to thrombosis within the vein. By dissection, Lowenstein observed that, with the arm in the abducted position, the costocoracoid ligament and subclavius muscle indented the axillary vein. When the arm is held in abduction or extension, the axillary vein is distended. Some contend that with distention of the axillary vein, pressure made by the costocoracoid ligament and subclavius muscle is sufficient to cause thrombosis. Other observers, on the basis of roentgen and autopsy studies, are of the opinion that the constriction of the vein occurs below the head of the humerus and against the subscapularis muscle. In violent trauma to the vein, a valve may be ruptured, which, in the opinion of other writers, is the fundamental basis of the thrombus. These theories do not explain those cases in which trauma is slight, or those occasional spontaneous cases without any history of injury. Reference is made to the findings of Cottalorda who, on operation, found no thrombosis but discovered that the vein was in a state of spasm. He advanced the theory that the lesion need not necessarily consist of a thrombus formation but that the vein may be held in a spastic state as a result of the irritation of the perisymphathetic venous plexus.

Prognosis as to life is good and duration of the disability is variable. Patients may be completely restored in from one to two months but in many cases the convalescence is prolonged because of edema, weakness, and stiffness of the arm.

In the acute stage the treatment consists of rest, elevation, and hot moist packs applied locally. For residual edema, an elastic bandage may be applied, beginning at the hand and extending upward to the shoulder. The advisability of removal of the thrombus by excision is questionable, since after removal recurrence is likely.

The diagnosis of primary axillary thrombosis is made on the basis of characteristic symptoms and signs. An important symptom is swelling of the arm with cyanosis that occurs within several hours or even days after the accident. There may be a history of an injury by strain. Occasionally no history of injury is given. Dilated, superficial veins are seen on the affected arm and over the anterior part of the chest and in the axilla. There is no fever and there are no signs of local active inflammation. The venous pressure in the affected extremity is increased and the circulation time prolonged. When the arm is

raised above the heart level, there is a delay or absence in the collapse of its superficial veins.

Röntgen examination with radiopaque dyes injected into the vein of the affected arm reveals the new collateral formation with enlargement and dilatation of the veins. In primary axillary thrombosis the axillary vein is not visualized by this technique.

HERBERT F. THURSTON, M.D.

Andersson O. Venography in a Case of So Called Traumatic Thrombosis of the Axillary Vein
Ida radiol. 1938 19 126

In the preliminary historical note the author observes that the peripheral vascular system is not accessible to direct investigation by roentgenography except in cases with calcification of the vessel wall. Attempts were made to fill the blood vessels with opaque material but the difficulty lay in finding a suitable contrast medium. Bismuth oil and lipiodol were eliminated clinically because of the danger of fatal emboli in some halogen derivative, such as sodium iodide are not free from danger for they may injure the intimal coat of the vessels. When the iodine complex is organically combined as in uroselectan little or no irritating effect may result. Colloidal solutions such as thorotrast are utilized without giving rise to irritating effects on the injected vessel. It is not yet definitely known whether these latter media are entirely without injurious consequences.

Arteriography has been employed in encephalography for the localization of emboli; for example venography has remained more in the background and has not yet arrived at the stage of actual clinical applicability. Dahl made use of venography to evaluate the speed of the venous current in his post-operative roentgen studies. This method of visualization of veins has been used in some cases of so called traumatic thrombosis of the axillary vein. The author reports his experience with venography in a case of traumatic thrombosis of the axillary vein.

The technique is simple and resembles an ordinary intravenous injection into a cubital vein with the patient recumbent and the arm slightly abducted. Usually 3 or 4 cc. of the contrast medium are required. An exposure which reveals the injected vessel filled up as far as the axillary vein is taken during the injection or exactly at its completion. The contrast effect disappears usually at the level of the clavicle because of the inflow of blood from so many large veins with the consequent dilution of the medium. To obtain the best possible filling of the axillary vein the injection should be made into the basilic or into the median cubital vein.

Obstruction in the venous drainage of an extremity may be due to thrombosis or to compression of the vessel by tumors, lymph nodes or masses of callus. In such cases venography may provide information as to the venous drainage through collaterals, if not in respect to the site of obstruction.

A fresh thrombosis should be regarded as a contra-indication for venography on account of the hazard of embolism.

So-called traumatic thrombosis of the axillary vein is rare and the clinical findings are quite characteristic. The symptoms begin with a rapidly developing stasis and swelling of the arm. Cyanosis gradually develops with distention of the cutaneous veins and of those of the pectoral area. The subjective symptoms are a feeling of tiredness and weight in the arm sometimes even gentle pains. There is often slight tenderness where the vein may be palpated as a firm cord. In most instances the patients are young healthy individuals usually men and generally of strong muscular type. In 50 per cent of the patients reported the symptoms are confined to the right arm. By conservative treatment with rest and the application of heat the symptoms usually recede in the course of one or two months.

The etiology is not clear and a number of theories have been advanced in the literature. All investigators are agreed however that the exciting factor is trauma. There must be a primary factor however for trauma can only activate the symptoms. The condition has been interpreted as a genuine thrombosis probably due to intimal injury of some sort. Some observers assume the presence of over-extension of the veins in connection with over exertion while others have suggested a compression of the veins by fascial and muscular fibers. Certain French writers have assumed a venospasm due to traumatic irritation of the sympathetic nervous system.

The author presents a case from St. Erik's Hospital that of a woman twenty six years of age who had previously been in good health. She worked in a library and after putting books on shelves in the course of a few weeks noticed a swelling and sense of weight in the left arm as well as prominence of the superficial vessels of the upper arm and axillary region. Upon her admittance to the hospital venography with contrast material revealed a well developed collateral vein along the lateral thoracic wall with obstruction in the axillary vein. The nature of this obstruction was not definite. A venogram of the right arm revealed normal conditions. With conservative treatment the swelling decreased and a month after the patient's discharge from the hospital a new venogram revealed filling of the collateral vessels indicating the persistence of an obstruction to drainage in the axillary vein.

In conclusion the author stresses the value of venography as an auxiliary to diagnosis in conditions with evidence of venous obstruction in the upper extremities. The method may provide information as to the collateral circulation and sometimes even as to the site and type of obstruction. In his opinion the procedure is contra-indicated in fresh cases of genuine thrombosis.

HERBERT F. THURSTON, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Hart, D. · Sterilization of the Air in the Operating Room with Bactericidal Radiation. Comparative Analysis of 132 Individual Stages of Extrapleural Thoracoplasties Performed with Radiation and 110 Stages Performed Without Radiation. *J Thoracic Surg*, 1938, 7, 525

Hart contrasts the incidence of wound infections in 132 individual stages of thoracoplasties during the last fifteen months, when irradiation of the operative field was employed, with a series of 110 similar procedures performed in the six years before ultraviolet irradiation was instituted. In the irradiated series there were no deaths from infection, and the incidence of infection was only 3.8 per cent, while in the earlier series there were 4 deaths from infection, or 3.6 per cent, and the incidence of infection was 33 per cent. Hart believes that this improvement is attributable to the use of ultraviolet irradiation, of both the operative field and the air of the operating room, which brings about a marked reduction in the number of organisms introduced into the wounds. He also points out that the temperature elevations were less high and less prolonged in cases operated upon with the new technique than with the old, that healing was more rapid in the irradiated group, that drainage was unnecessary, and that the interval between stages could safely be reduced if ultraviolet irradiation was used.

In his conclusion he emphasizes the importance of atraumatic technique and meticulous hemostasis, with the free use of silk, in the decrease of the incidence of infection. However, conditions are not ideal in thoracoplasty operations, and any measure which reduces the number of organisms gaining entrance to the field will be particularly helpful in this type of surgery. Another improvement in technique is the employment of subcuticular sutures of wire for wounds which later will have to be reopened. This decreases the number of organisms entering the subcutaneous tissue from the skin. The author does not comment on the possibility that an important factor in the reduction of infections might have been the improvements in technique made possible by the greater number of patients treated per year during the period when irradiation was used, than the number treated during the preceding years.

JOHN S. LOCKWOOD, M.D.

Riese, J. · The Hematoma-Phobia and the Prevention of Hematomas (Hämatomfurcht und Hämatomverhütung). *Zentralbl f Chir*, 1938, p. 1059

This article is opposed to the assertions of Noetzel, who stated that the prevention of hematoma is the duty of every conscientious physician and

emphasized this statement in opposition to the proposal, bobbing up frequently of late, that subcutaneous ligatures be avoided. Riese expresses the opinion, based on his earlier works, that the statement that the formation of hematoma favors suppuration is not correct. On the other hand, it was proved that tissue-necrosis results from ligation, or, at the crushed places, from application of the artery forceps and leads more readily to suppurative processes. It is true that when the author began to reduce the ligation of the bleeding vessels to the lowest possible point, the number of hematomas increased at once from 4.5 to 5.5 per cent. Now, however, he has fewer hematomas than previously. When hematomas develop as a result of coughing or vomiting, they are invariably found to be sterile. Nevertheless they should be avoided, not so much because they favor suppuration, as because they hinder direct apposition of the wound surfaces and delay healing thereby, and because there is the danger of their breaking through and becoming secondarily infected. When a hematoma develops the author waits until the ninth or tenth day before he removes the stitches. Small effusions of blood are punctured aside from the suture line; large ones are opened within the first twelve or twenty-four hours, as a rule, and the bleeding vessel is ligated (it is always only one vessel that is bleeding) and immediately sutured secondarily. Invariably there is primary healing. When a wound breaks open later and a hematoma breaks through, it is removed, and the edges of the wound are freshened and re-sutured immediately. In these cases the healing is also by first intention. With regard to the formation of hematomas, the author refers to his experiences with the much-feared scrotal hematoma. Previously, when ligation was always carefully carried out, the complication was more frequent, now it is a rarity. He avoids all compressive dressings and the laying on of sand-bags, since the normal circulation of the blood and nourishment of the tissues are disturbed thereby, and secondary bleeding occurs.

When operating Riese is governed by the following rules:

1. Bleeding from skin, fat, and muscle vessels is disregarded. If the bleeding obscures the field of operation it is packed off.

2. Sponging and wiping with gauze, immediately preceding the suturing of the wound, are entirely avoided, since by these means an impetus to secondary bleeding is given and spontaneous hemostasis is hindered. Coagula and fat-particles are carefully removed with a pincette.

3. Vessels which are still bleeding when the skin is to be sutured (a great rarity) are ligated.

4. Only the peritoneum, fascia, and skin are sutured. The stitches are placed close together but they are drawn loosely.

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HERBERT F. THURSTON, M.D.

Andersson O. Venography in a Case of So Called Traumatic Thrombosis of the Axillary Vein.
Acta radiol. 1933 19 126

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HERBERT F. THURSTON, M.D.

complished completely by the application of large split grafts, or partially with scattered small grafts that serve as foci from which epithelization spreads in all directions, it should be done with the least possible disturbance to an already sick patient. Usually the patient can be put in a fair condition before this is attempted, but sometimes very simple types of grafting are done in the hope of aiding a patient who is making poor headway. When grafts are applied to an extensive raw surface at this early period, no special attempt is made to correct contractions that have already occurred, but a successful take should greatly limit further distortion and permit the healing period to be measured in terms of days rather than of weeks, months, or even years.

The chief factors in the late correction are the liberation of false union and the elimination of binding scars. These can usually be done by the excision of scar areas down to their deepest elastic layer, and by the immediate application of large split-thickness skin grafts, full-thickness grafts, or a sliding or pedicled flap. There is little to be gained by the attempt to grow skin grafts on a granulating area of years' duration without first the removal of the granulations, as well as of the underlying scar, which may be from a fourth to a half of an inch thick. Most important of all is the proper early care and coverage of deep burns of the back of the hand and fingers, where the tendons and joint capsules lie almost immediately beneath the skin. Few hands that have been allowed to heal spontaneously (having remained uncovered for months or having been allowed to rest out of the position of function) can ever be restored to anything like normal usefulness.

Abel, J. J., Hampil, B., Jonas, A. F., and Chalian, W. Researches on Tetanus. VII. (1) The Time Required for the Fixation of a Fatal Quantity of Tetanus Toxin. (2) the Return Passage of Toxin by Way of the Lymphatic Capillaries to the Cardiovascular System, (3) the Return Passage as the Basis of a Method for the Approximate Determination of the Volume of Lymph in the Closed Lymphatic System. *Bull Johns Hopkins Hosp*, Balt, 1938, 62 522

On the basis of animal experiments, the details of which are recited in the paper, the authors arrive at the following conclusions:

When an animal has been injected with one or more lethal doses of tetanus toxin, the time of its death is determined by that fraction of the toxin that has been fixed by the specifically reacting organs of the body in the first few hours during which they were exposed to the requisite threshold concentration of the poison. Neither the bio-assay nor any other method now at our disposal enables us to detect and assay this fixed fraction of injected toxin.

When three lethal doses of the toxin were injected intravenously, the irreversible fixation of a lethal dose was completed in the relatively short time of from five to seven hours. This and the other facts enumerated below were established with the help of the "wash-out" method.

The toxin begins to be fixed in an irreversible manner from the moment it reaches, via the blood stream, the motor neurons of the central nervous system and the end-plates of the voluntary muscles. There is no brain-blood barrier that stands in the way of the steadily progressing uptake and fixation of blood-borne toxin by central motor neurons.

When a dog is given time to fix a lethal fraction of several intravenously injected dog lethal doses, and is then deprived of the free circulating toxin by the method of viviperfusion with whole blood, the injection of a relatively large dose of antitoxin during the period of incubation will save the animal. The antitoxin saves life under these conditions by neutralizing the toxin that has been irreversibly fixed by the motor neurons and the motor end-plates. The long-held belief that an impenetrable brain-blood barrier stands in the way of the uptake of blood-borne tetanus antitoxin is therefore just as untenable as is the belief that blood-borne tetanus toxin is unable, by its diffusive power, to pass through this assumedly impenetrable barrier. After a single truly lethal dose of the toxin, or after many lethal doses have once been fixed, the prophylactic action of the largest possible amounts of anti-tetanic serum that can be injected will not save the animal if the injection of the serum is delayed until the first symptoms of a descending tetanus are clearly in evidence.

It must not, however, be thought that a conclusion of this kind, which is based upon animal experiments in which all of the several factors that determine death are completely under control, is directly applicable to human tetanus. In dealing with a case of general tetanus in man, in which none of the factors is under control, and in which there is now no way of learning whether a full lethal dose of the toxin, or less, has already been fixed in the body, no other course is open to the physician than to inject anti-tetanic serum in accordance with present usage.

Within eight hours after the intravenous injection of many lethal doses, an equipartition, in the sense that the blood and the lymph of the thoracic duct contain the same amount of toxin per cubic centimeter, is established between the two fluids.

The reverse passage of the toxin that occurs in the course of the "wash-out" or viviperfusion experiments gives us a method of approximately determining the lymph volume of the closed lymphatic system of a normal resting animal.

HAROLD OCHSNER, M D

Starup, U.: Review of the Newer Experiences with Prontosil and Related Substances (Eine Uebersicht ueber die neueren Erfahrungen mit Prontosil und verwandten Substanzen). *Hosp-Tid*, 1937, p 1232

The treatment with prontosil of infections with pathogenic cocci has shown extremely favorable results. It has been the same with the various combinations related to prontosil. Prontosil is a red azo-dye stuff, 4-sulphonamid-2-4-diamino-azobenzol. It

5 Compressive dressings as well as sand bags are never used. Riess has never encountered severe secondary hemorrhage nor has Boehler in 15 000 accidental wounds.

Riess also believes that contrary to the views of Schmieden and Gorgon we shall come closer to the avoidance of postoperative suppuration in aseptic operations as we practice operating in silence lose our fear of the development of hematoma and ligate as little as possible. The universal statistical average of 7.4 per cent suppuration has been lowered by Riess to 0.093 per cent since he introduced his method of silent operating and his cases of hematoma are much fewer than previously when he was stopping the bleeding at once with forceps or ligation. (FRANK) JOHN W. BREEN, M.D.

Kaunitz J. Dry and Wet Stages of Obstructive Atelectasis. *J Thoracic Surg* 1935 7 512

Although the term atelectasis has been subject to much criticism and in its true sense may be best applied to the congenital state in which the lung is airless or collapsed it seems proper to use it to the exclusion of all others in the airless condition resulting from bronchial obstruction. The term however fails to suggest the mechanisms of development of the process its etiology or its sequelae. The simple condition too is rarely found in lung standing cases of bronchial obstruction as there is subsequent pneumonic consolidation abscess formation bronchiec-tasis or fibrosis.

Atelectasis may be massive lobar or lobular the type depending upon the bronchus occluded. In acute conditions especially following surgery an entire lung may be involved while in the aged or in invalids kept for long intervals in the decubitus position stasis of the mucus in the smaller bronchi may result in patch or lobular atelectasis. The author wishes to stress three arbitrary stages of atelectasis as the result of bronchial obstruction (1) the dry or early stage which occurs with the absorption of alveolar gases (2) the wet stage resulting from the transudation of plasma and the accumulation of bronchial secretions in the alveoli and (3) the fibrotic stage which follows a wet stage and denudation of the alveolar epithelium.

The roentgenographic shadows of the obstructive atelectasis differ in accordance with the stage. The clinical diagnosis of atelectasis is discussed in this article and the differential points in the three stages are stressed and well illustrated.

HOWARD B. CARROLL, M.D.

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Blair V. P. and Hyatt L. T. The Treatment of Wounds Resulting from Deep Burns. *J Am M Ass* 1935, 110 1893

On the average deep burns constitute the most neglected of all wounds amenable to surgery. Because of this hospitalization and the wound-dressing

period are unnecessarily prolonged and often followed by months years or possibly a lifetime of discomfort or disability pending a belated surgical repair. This statement is based on a series of 300 late burns treated since 1918 in which the average time that elapsed between injury and inauguration of surgical repair was five and one tenth years. The average period of disability in this group from the time of injury until final discharge was six and eight tenths years.

During the first several weeks after the infliction of the injury it is unnecessary and often impossible to distinguish between partial and full thickness destruction of the skin, but areas of both types of destruction are commonly present in almost every extensive burn. The primary consideration during this early period is the immediate problem of saving life. The greatest help will come from the control of pain worry and infection. The most critical time having been successfully bridged active steps for surgical repair are in order. Our observation of the cases cited forced the conclusion that opportunities for early repair had not been adequately met in the great majority of instances, because of the lack of realization either that what was a burn had changed to a granulating wound or that the closure of the residual wound could be materially hastened by appropriate surgical attention. After total destruction of the skin spontaneous repair is of late occurrence and is accomplished by three distinct but somewhat overlapping processes. First the raw surface is gradually covered by granulations second the deeper and older layer of these granulations takes on the character of a contracting scar which draws in the surrounding skin and superficial layers and thus decreases the actual surface area to be repaired third after some days weeks or months earlier under proper treatment epithelialization of the remaining raw surface starts with a visible ingrowth of the surrounding skin.

Examples of raw surfaces which have persisted for from three to thirteen years or more after a burn are not lacking in our files. In contradistinction to the second degree burn the time at which surgical repair of extensive third degree burns can be advantageously undertaken will in most cases be very largely influenced by the type of local and general care that was administered from the time the burn occurred.

The great majority of surface burns do not quite destroy the full thickness of the skin and healing will therefore occur spontaneously in what appears to be a reasonable time regardless of the type of treatment used. However when any plan of expectant treatment is relied on entirely in the care of the less frequently occurring large deep burn the result may be unfortunate for the patient.

Active surgical repair of a deep burn of any considerable size should be initiated as early as is practicable in the healing period and permanent skin coverage of all raw surfaces should be performed in one or several operative steps. This may be ac-

Ferguson, F. R., and Watkins, K. H.: Paralysis of the Bladder and Associated Neurological Sequelæ of Spinal Anesthesia (Cauda-Equina Syndrome). *Brit J. Surg*, 1938, 25 735

Impressed by the consistency of the symptoms in the so-called "cauda equina syndrome," Ferguson and Watkins, of the Manchester Royal Infirmary, report upon 14 cases of spinal anesthesia with resultant neurological dysfunction. Before their report, only 16 examples of this same condition were to be found in the literature.

It is not their purpose to disparage spinal anesthesia, which they look upon as a logical and valuable procedure, but they believe that the untoward results, when they occur, are so distressing that it seems important to study the mechanism of the production of the caudal pathology. In the authors' cases, almost immediately following spinal anesthesia, there were: (1) retention of urine, succeeded by incontinence, (2) incontinence of feces, with variable degrees of loss of sphincter tone in various individuals, (3) impairment of sensation in the saddle area, in some cases extending down the posterior surface of one thigh, and (4) absence or diminution of one ankle reflex, and occasionally absence of both ankle reflexes and even of the knee reflexes. The patients formed a group so striking as to the similarity of their symptoms that it was believed that a definite type of cauda-equina lesion must have been produced in some manner by the spinal anesthetic. Heavy duracaine had been used in all cases. The bladder symptoms were immediate, but the rectal symptoms were delayed up to ten days, which suggested, perhaps, a progressive lesion. The bladders showed a retention of the urine and a large capacity, some of them showed marked trabeculation of the walls, and nocturnal

incontinence; frequency was common. The anal tone gradually recovered in from one and one-half to thirty-two months, but in some cases there was a very troublesome rectal anesthesia. Saddle anesthesia (sacral 3, 4, and 5) was a general complaint, it had been present for at least one year in all patients, and in some patients as long as three years. The loss of the deep tendon reflexes varied rather widely in degree. Some patients showed marked motor involvement, and all 14 patients presented some amount of weakness, atrophy, and fibrillation in one or both legs. In some males the sexual function was moderately impaired. Many patients developed trophic ulcers.

In those cases in which autopsy material was available, no definite macroscopic cord or caudal changes were found, but some of the cords showed increased hyalinization of the vessels and some marginal pallor. The Marchi stain revealed no definite change. Some of the sacral nerve roots showed a fine vacuolization, thought to be evidence of recent degeneration.

Direct trauma to the conus or nerves, hematoma formation, or inflammatory reaction were not held responsible for the complications, the alcohol and glycerine, likewise, were not thought to be the damaging agent. Rather, the toxic effect of the anesthetic itself was held to be the causative factor. The authors think that procaine in combination with alcohol and glycerine (and gladin or gum acacia) injected in full strength in the caudal area exerts, in susceptible individuals, a toxic, degenerative effect on the rootlets where it is first deposited and held for a time in full concentration before it has become diluted by cerebrospinal fluid. They deprecate the use of heavy duracaine in its present form.

JOHN MARTIN, M D

is easily and quickly absorbed by the intestine and pharmacologically extraordinarily indifferent. It is administered per-orally, subcutaneously, and intravenously and is rapidly excreted through the kidneys. In the streptococcus sepsis of the mouse and rabbit it exerts a selective streptococcus bactericidal effect. *In vitro* on the contrary, it is but feebly bactericidal. Soluble prontosil which was produced later, has a corresponding therapeutic effect and because of its solubility, is better adapted to injection treatments than prontosil to which preparation it is even chemically but distantly related. The sodium salt of 4 sulphonamidophenylazo-7 acethylamino 1 oxynaphthalin 3 6 di sulphonic acid. Other bactericidal preparations which are cited are prontosil album, prontosil and colosalum, all of which may be included under the one general name sulfanilamide. The effectiveness of the prontosils may reside in the splitting off of sulfanilamide components in the living organism. Sulfanilamide therapy seems to have special efficacy in the following streptococcus infections: puerperal fever, infected abortions, severe angina. In these cases the treatment, without a doubt, results in a decrease in the number of fatalities. Good results are also observed in the treatment of erysipelas; however, not of its complications which remain unchanged in incidence as well as severity. Up to the present time the treatment of septic conditions with pyemic complications in the organs has remained without positive results. This is true also of the treatment of endocarditis. The sulfanilamide combinations seem to be without significance as a means of the treatment of staphylococcus infections, although good results have been reported in a few instances. Favorable effects have been observed also following intralumbal and peroral administration in cases of meningitis. Likewise in cases of gonococcus infection a few favorable experiences have been reported. Sulfanilamide has been employed extensively in the treatment of infections of the urinary tract especially in children. In these cases good results have been attained in the colon bacillus as well as in the coccal infections, the good effects appearing rapidly in these cases. Results seem to be superior to those of mandelic acid therapy.

As a rule soluble prontosil is injected in daily doses of from 20 to 40 c cm and more and sulfanilamide in daily oral doses of from 2 to 4 gm. The toxic dose of this preparation seems to be a very high one. The blood pressure and cardiac function are unaffected. Even in cases of kidney disease the kidney function remains uninfluenced. At the most in administration by mouth dyspeptic symptoms and in high dosage elevation of the body temperature develop which may be accompanied by exanthema. However neither swelling of the glands nor joint pains accompany these manifestations which tend to disappear after from four to ten days. Among the only recently recognized complications may be included severe anemias and simple agranulocytosis. However, in spite of the extraordinarily

large number of cases treated, these complications are observed only as an occasional phenomenon explainable as a stray instance of sulfanilamide intolerance. The author refers to a complication of the nervous system observed by Bucy in a patient who had received treatment with sulfanilamide for a recurring osteomyelitis, a toxic optic neuritis developed.

In consideration therefore, of the cited complications and despite its excellent therapeutic effectiveness, sulfanilamide should be used only under the strictest indications and close watch.

(HAAZEN) JOHN W. EATON M.D.

ANESTHESIA

Macdonald A. D. and Watkins A. H. An Experimental Investigation into the Cause of Paralysis Following Spinal Anesthesia. *Brit J Surg.* 1913, 25 379.

The authors used cats in their experimental investigation into the cause of paralysis following spinal anesthesia. Heavy durocaine in the same concentration but in greater bulk than when used for spinal anesthesia in man, was injected intrathecally. They also injected separately the various constituents of the anesthetic solution without the addition of the active ingredient procaine. A total of 150 cats were studied. In 23 of these injected with alcohol and glycerine alone there was no evidence of development of a cauda-equina syndrome (urinary incontinence, fecal incontinence, loss of reflexes, paralysis of hind limbs and tail). In an equal number of cats injected with heavy durocaine 35 per cent became paralyzed.

In studying the relationship of the dosage of procaine HCl to the incidence of the symptoms, the authors found that in 20 cats injected with a 2.5 per cent concentration no paralysis occurred; of 20 cats injected with a 5 per cent concentration 10 per cent became paralyzed; of 56 cats injected with a 10 per cent concentration 43 per cent were paralyzed; and of 8 cats injected with a 10 per cent concentration 80 per cent were paralyzed and 3 of the 8 died. It should be recalled that from 2 to 3 c cm. of from 7 to 10 per cent durocaine is usually used in man.

The heavy durocaine which was used by the authors was of the following composition:

Procaine HCl		
'Flanocaine brand	0.1	gm per c cm
Gladin	0.0025	gm per c cm
Glycerine	0.1	gm per c cm

This was altered to the following composition:

Procaine HCl		
'Flanocaine brand	0.1	gm per c cm
Gum acacia	0.002	gm per c cm
Glycerine	0.016	gm per c cm

In both cases the solutions were made up in 15 per cent ethyl alcohol. JOHN MAXLEY M.D.

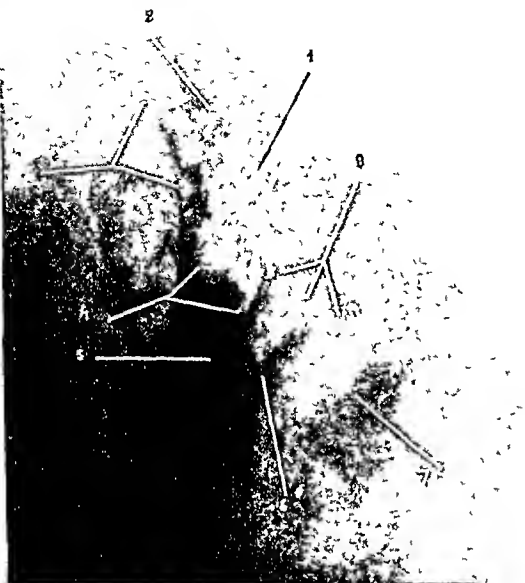


Fig 3 X-ray film obtained by Mayer's technique, (1) periantral cells, (2) mastoid cells of the base, (3) anterior border of lateral sinus, (4) aditus ad antrum, (5) region of semicircular canals, (6) tympanic cavity, (7) condyle of mandible, (8) portion of the attic projected upon the medial extremity of the external acoustic meatus of which the anterior wall (A) and the posterior wall (B) can be clearly seen

This standard series includes, in the author's opinion, all the exposures required to obtain a clear visualization of the pyramid, but in some cases additional films may be necessary

The indications for the various techniques employed are the following

1 Stenvers' projection complemented by Mayer's projection permits an accurate study of the form and the pathological processes of the petrous portion of the temporal bone, including its superior profile, the labyrinth, and the apex

2 Schueller's and Ceresole-Malcangi's projections are best suited for the visualization of the mastoid process and the air-cell system

3 Mayer's projection is especially useful for the visualization of pathological processes involving the periantral region

4 Visualization of the lateral sinus and its relations to the system of air cells is best obtained by Schueller's, Stenvers', or Mayer's projections

RICHARD E. SOMMA, M.D.

Solis-Cohen, L., and Levine, S.: X-Ray Diagnosis of Complete and Partial Acute Intestinal Obstruction *Radiology*, 1938, 31 8

The authors believe that the radiologist can make a correct diagnosis in early cases of obstruction,

which the clinician may not be able to do even after thorough examination Ochsner proved that strangulated obstruction can be demonstrated with x-rays after one hour, and simple obstruction after three hours He concluded that an accumulation of gas is the first sign rather than an accumulation of gas and fluid In all suspected cases of ileus the authors routinely take three views, the anteroposterior, the postero-anterior, and the upright They believe that the anteroposterior view is the most valuable for the differentiation of the large bowel from the small

The first x-ray signs in an incipient case of ileus of mechanical origin are the presence of trapped gas and what is termed the "hairpin turn" The persistent appearance of a dilated loop of small bowel on successive films at hourly intervals is, in the opinion of the authors, evidence of an oncoming ileus A dilated "hairpin turn" in the small bowel is the beginning of the so-called "step-ladder appearance," and in its presence a developing ileus must be suspected

The significance of intestinal gas within both the small intestine and colon is as follows:

If the entire colon is dilated and only a small amount of air is seen in the small bowel, obstruction of the small intestine can be excluded. Tremendous dilatation of the colon, or a part of it, associated with



Fig 1 Note the distended small intestinal loops in right lower quadrant due to intestinal obstruction produced by postoperative adhesions

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Bignami C. Roentgenological Technique and Anatomy of the Pyramid of the Temporal Bone (Tecnica ed anatomia radiografica della piramide temporale) *Radiol med* 1938 25 495

From an accurate study of the roentgenological visualization of the pyramid of the temporal bone Bignami concludes that it is impossible to make a satisfactory projection by means of which this structure can be adequately visualized in all of its details and anatomical relationships. This is primarily due to the hidden position of this bony process within the cranial vault and also to the multiplicity of surrounding or superimposed structures presenting various degrees of density.

In order to enable the roentgenologist to obtain a satisfactory visualization of the osseous framework of the inner ear it is necessary to obtain a series of pictures each showing the various portions of this bone taken at a different angle. Control pictures of the healthy opposite side should also be obtained for comparison.

In selecting the various exposures the author proposes the taking of a standard series based on fundamental criteria in order that unnecessary expense and labor be avoided. This series should enable the roentgenologist (a) to ascertain the posi-

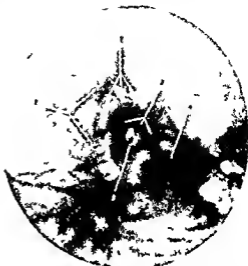


Fig. 2. X-ray film obtained by Schueller's technique (1) mastoid cells (2) antrum and petrous region (3) region of labyrinth (4) condyle of mandible (5) external and internal acoustic meatus appearing almost concentrically one within the other



Fig. 3. X-ray film obtained by Stemmer's projection (1) cochlea (2) vestibule (3) posterior semicircular canal (4) mastoid cells (5) borders of lateral sinus (6) region of antrum and petrous cells (7) tegmen labyrinthi (8) superior semicircular canal (9) internal acoustic meatus and (10) apex of petrous bone

tion of the pyramid and to establish its anatomical relations to other structures (b) to visualize the various faces and margins of the apex (c) to visualize clearly the structures of the internal cavities and of the system of air cells and (d) to compare the films with those of the opposite healthy side.

The various standard projections proposed by the author for an adequate roentgenological series include

- (a) Stemmer's projection (occiput-zygomatic plane)
- (b) Schueller's projection (temporozygomatic plane also called transversal oblique plane)
- (c) Axial submento-bregmatic plane
- (d) Sagittal anteroposterior transorbital plane

Figures 2 and 3 show x-ray films taken according to Stemmer's and Schueller's technique respectively.

The following exposures may be necessary also for a more complete visualization of the petrous portion of the temporal bone of the mastoid region and of the air cell system

- (a) Fronto-suboccipital plane (Worms and Bretton's projection)
- (b) Mayer's projection (Bregmatic temporal plane)
- (c) Ceresole's and Maccagni's projection (sagittal oblique plane)

Figure 3 shows the x-ray film taken according to Mayer's technique

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Telford, E. D., and Simmons, H. T.: Chronic Lymphedema. *Brit J Surg*, 1938, 25 765

A classification of chronic lymphedema, based on history and clinical features, is suggested as follows. (1) Milroy's hereditary edema, (2) congenital edema, (3) obstructive edema, (4) post-traumatic edema, and (5) spontaneous edema

Milroy's hereditary edema This condition appears to be one of great rarity. Milroy's patient gave a genealogical history to the sixth generation, of 97 individuals, no less than 22 had suffered from chronic edema. The patient was a man thirty-one years of age, of good physique, who suffered from a chronic edema of both legs, to the level of the knees. The condition was stationary and had been present since birth. A study of Milroy's report suggests that the condition he described was probably a diffuse lymphatic hygroma of congenital origin. The familial transmission of such angiomatous misshaps is well known

Congenital edema The authors have seen a number of patients with this type of lymphedema in the feet and legs, and on the dorsum of the trunk. In 1 patient there was edema of the arm and leg on the same side

This form of the condition appears to be a diffuse lymphatic hygroma analogous to the type occasionally seen in the neck of infants (cystic hygroma or hydrocele colli). It no doubt represents a congenital aberration in the development of lymphatic vessels analogous to that which results in the case of capillaries and venules, in venous naevi, and, like these, it may be localized or diffuse

Obstructive edema The cause of this type of edema is a capillary lymphangitis of widespread nature, due in many cases to streptococcal infection and followed by a diffuse perilymphatic fibrosis. The condition is seen after frank streptococcal infections, such as erysipelas, and is best known in relation to filarial infestations in man. It appears more likely that the resulting elephantiasis is due to the inflammatory reaction rather than to mechanical obstruction by the parasites themselves. In this group are also those edemas of the arms, secondary to massive involvement of the axilla by new growths. A similar condition is often seen as the result of post-radiation fibrosis

Post-traumatic edema In most of the recorded cases, the injury is a blunt trauma of no great severity and without open lesions of the tissues, but in some instances this condition has been reported following dog and cat bites

Regarding the mechanism of the production of the edema, all that can be said at present is that for some unknown reason the normal process of

repair following a contusion fails, and a disorder of the lymphatic mechanism is initiated at the site of injury, which may spread up and down the limb. Whether this disorder is an embarrassed return flow or an increased output is not clear, but the authors' cases have shown a considerable delay in the excretion of dyes following their local injection

The clinical and operative appearances and findings are exactly the same as those described in spontaneous edema.

Spontaneous edema. It must be admitted that this type has no clear-cut diagnostic features. It differs from the other types in that no definite cause is apparent, the condition occurs in both sexes, and appears to arise at all ages. The edema develops insidiously as a puffiness about the ankle, spreads slowly upwards, and may eventually involve the skin of the abdomen and trunk. The limb may after some years reach an enormous size, but it remains of normal color and is not liable to the chronic ulceration which is found so frequently in the "white leg." The disease is more commonly unilateral, but in some instances the other leg is eventually involved. The skin is much thickened, the subcutaneous fatty tissue is enormously increased in depth, and the deep fascia is thickened. The disease never penetrates below the deep fascia

The treatment of chronic lymphedema is discussed. Methods such as rest, massage, and elastic pressure give purely palliative and fugitive results. Surgery approaches the attack on lymphedema by one of two ways (1) the attempt to utilize the normal lymph paths beneath the deep fascia (Kondoleon), and (2) the use of some form of sympathectomy.

Since 1930, the authors have performed the Kondoleon operation on 6 patients with chronic lymphedema in the lower limbs, and have been able to examine the results in 5 of these patients. In the case of only 1 patient was the result satisfactory. However, it is noteworthy that in 3 of the patients who were operated upon previously, six, five, and four years, respectively, further upward progress of the disease has been arrested

Since August, 1936, 5 patients with chronic lymphedema of the lower extremity have been subjected to sympathectomy. The operation consisted of lumbar cord ganglionectomy involving the chain opposite the second, third, and fourth lumbar bodies. The end-results of this operation in lymphedema have been most disappointing. During the three weeks following the operation a remarkable shrinking of the limb occurred, much greater than is ever produced by rest alone, but once walking and work were resumed the limb quickly reverted to its pre-operative size and shape.

The authors conclude that lumbar cord ganglionectomy (and by inference any lesser form of

fluid levels and the absence of gas in the small intestine is indicative of obstruction of the large intestine. It is sometimes difficult to differentiate between the large and small bowel.

Morphine produces a general atony of the intestinal tract and its effects may be manifested by large accumulations of gas both in the colon and in the small bowel. The distribution of gas permits the differentiation of morphinization from ileus.

Fluid levels in the obstructed bowel are apparently late signs of obstruction and are due to intestinal hypersecretion. The higher the obstruction is situated the greater the amount of fluid present. Marked distention of loops of the small bowel points to a high obstruction. The typical step ladder appearance is a late sign of obstruction. The presence of striations in the mucosa indicates jejunal obstruction while the ileum is relatively free of

valvulae conniventes. Duodenal or jejunal obstruction due to subhepatic collections is typified by marked distention of proximal loops of the small intestine and gastric dilatation.

The differentiation of adynamic ileus, peritonitis and mechanical obstruction may be impossible by roentgenography alone. Dynamic ileus is diffuse and generalized and usually presents marked dilatation of the bowel. Carcinomatosis has been diagnosed roentgenologically by the observation of features of obstruction with a generalized haze throughout the abdomen coupled with a fading or complete blotting out of the psoas shadows.

While the roentgenologist may venture an opinion as to whether the obstruction is high or low, most often he cannot state definitely in which quadrant of the abdomen the lesion is situated.

HAROLD C. QUINER, M.D.

Occasionally active treatment will be demanded, and then probably the wisest plan is to employ such measures as minimal exposure to radium, or the injection of small quantities of sclerosing fluid, the application of a firm dressing, or painting with collodion or Unna's paste. Whatever is done must be so slight as to be entirely free from any risk of causing a scar. This line of treatment is made all the easier because the appearance of the nevus at any particular age can be more or less accurately foretold, and the parents' confidence can be gained.

If a nevus shows no active growth in infancy, it is unlikely to retrogress of its own accord. It may not start to grow for many years, and then only very slowly. It can be dealt with deliberately when the child is older.

SAMUEL KAHN, M D

Davis, L., and Barker, M. H.: The Surgical Problem of Hypertension. *Ann Surg*, 1938, 107: 899

This paper is a preliminary report, the purpose of which is to set forth the approach which these investigators use in their attack on the problem of the surgical treatment of hypertension. They state that hypertension has been produced experimentally in four ways: (1) by removal of the carotid sinus and the cardio-aortic moderator nerves (Heymans), (2) by the production of renal ischemia (Goldblatt), (3) by the production of cerebral anemia and anoxemia of the vasopressor centers, and (4) by the administration of Vitamin D. They have not been able to correlate the hypertension of human subjects with the anatomical and physiological changes noted in animals in which hypertension has been produced by any of these methods—a matter which has been of concern to many American clinicians since the advent of Goldblatt's method of producing hypertension. They point out that an adequate definition of hypertension has not yet been found, and that even a clear distinction between essential and malignant hypertension has not yet been attained.

An urgent need is felt for reliable criteria on which patients with hypertension may be selected for surgical treatment. In their own series of cases they have chosen only relatively young hypertensive patients without renal damage, whose blood pressures under normal conditions show rather marked fluctuations, whose vascular tree is still elastic, and who, after adequate trial, have been found to be insensitive to cyanate therapy. After a long period of observation as out-patients, they are admitted to the hospital for more critical study. Renal function tests, detailed blood-chemistry studies, detailed charts of blood pressures under all conditions found in the twenty-four-hour schedule of the patient, the "cold pressor" test, and vasodilator tests with the use of drugs are all accomplished. In addition, blood-pressure readings are made during the administration of carbon dioxide. Not until all these data are complete and analyzed is the patient considered from the standpoint of surgical therapy. Early results obtained by the authors suggest that

cyanate-resistant patients become more cyanate-sensitive following splanchnic resection.

Davis and Barker believe that neither the rationale nor the results of many operations performed in the past for hypertension are susceptible to an accurate physiological explanation, and that many of the results are not conclusive. They believe that clinical investigations must be conducted on anatomical and physiological principles, in the same manner that any laboratory experiment would be carried out.

JOHN MARTIN, M D

Gurney, C. E.: Experimental Study of the Behavior of Free Fat Transplants. *Surgery*, 1938, 3: 679

There are certain clinical problems associated with the transplantation of fat which justify further experimental study. It is well known that practically all fat grafts gradually diminish in size following their transplantation.

Experimental studies designed to show the behavior of free transplants of fat were made on 185 white adult rats of average size. In each instance subcutaneous or peritoneal fat was transferred to a subcutaneous pocket in the thoracic region. The rats were divided into five groups, depending on the treatment received by the graft immediately prior to its transplantation. Group A comprised the rats in which autotransplants of fat of the groin were transferred as a single piece without trauma. Group B included those in which autotransplants of fat of the groin were cut into multiple pieces with a sharp razor. Group C included those in which autotransplants of fat of the groin were severely traumatized by squeezing with a hemostat. Group D comprised those in which homotransplants of fat of the groin were transferred without trauma. Group E included those in which autotransplants of fat obtained from the peritoneal cavity were transferred without trauma.

The rats in the first four groups were killed at intervals of one, two, and three weeks, and one, two, three, four, six, nine, and twelve months after the operation. In the last group they were killed one week, and one, four, nine, and twelve months after the operation. At each examination the surviving grafts were studied grossly and microscopically. All of the sections were stained with sudan III and a few were stained with hematoxylin and eosin.

The outstanding gross finding was that almost without exception those autografts which were transplanted as a single piece without trauma (Groups A and E) retained their identity throughout the whole year of observation. Those autografts which were cut into multiple pieces or crushed (Groups B and C) survived for a shorter period. Except for two grafts the transplants in both groups had completely disappeared after four months. The homografts (Group D) survived only for a very short time. Not the slightest suggestion of a graft was found after three months.

All of the grafts were soft to palpation for the first day or two after operation. About the third or

sympathectomy) has no place in the treatment of chronic lymphedema of the extremities

JOHN H. GARLOCK M.D.

Slome D and O Shaughnessy, L. *The Nervous Factor in Traumatic Shock* *Br J Surg* 1938 25 900

The authors believe that their previous experiments eliminated toxemia as a causal factor of traumatic shock and they were left with the problem of two remaining factors: fluid loss at the site of trauma and the production of nervous impulses in that area. A series of 203 experiments is reported in which attention has been confined to the establishment of the role of the relative importance of fluid loss and the nervous factor. Cross circulation blood transfusion, spinal anesthesia and amputation experiments are the basis for the following conclusions:

The initial effect of trauma is either a pressor effect or a depressor effect. The latter effect is observed when there is definite marked muscle damage with consequent large fluid loss. The initial fall is absent (1) in the case of trauma with ligation of the arteries to the limb and (2) in trauma to a limb that is kept alive by cross circulation experiments or by perfusion with the Dale Schuster pump. The initial fall is present in experiments in which the nervous factor is controlled. It is present when trauma is applied after spinal anesthesia or after cocainization or section of the nerves from the limbs traumatized. The initial fall in pressure when present must be attributed therefore to the loss of fluid from the circulation and to hemorrhage into traumatized tissues.

The subsequent gradual decline of the pressure cannot be attributed to the continued operation of the fluid loss as it is absent (1) when trauma is applied under spinal anesthesia (2) when trauma is applied to the denervated limb and (3) when the perfused denervated limb is traumatized and it is present when the nervous factor is operating when no fluid loss can occur as in the experiments in which trauma is applied to a limb kept alive by cross circulation or perfusion and connected to the animal only by neural connections. The initial depressor effect of trauma is due to fluid loss; the significant secondary decline to shock is caused by the continued and continuous discharge of nervous impulses from the traumatized area. The nervous factor operating alone can cause death. The fluid loss in these experiments provided the nervous factor is controlled is not fatal. The authors regard this concept of the late development and persistence of the nervous barrage as of fundamental importance in the understanding of the etiology of surgical shock.

HAROLD OCHSNER M.D.

Hester W. A. *The Natural History of Strawberry Nævi* *Lancet* 1938 234 1479

Strawberry nævi commonly called cavernous angiomas are always raised to some extent above

the general level of the skin. They are present at birth or appear soon afterward. They grow more or less rapidly during the first few months of life and thereafter invariably retrogress and disappear completely at about the fifth year of life leaving little or no trace.

Essentially the lesion consists of an area of excessive vascularity. The redundant vessels may be situated in the superficial layers of the skin only or may be confined to the deeper layers and subcutaneous tissue. Commonly all sites are involved to a varying degree. The clinical appearance depends upon the site mainly affected. Even the most superficial type of nævus is always somewhat raised above the surrounding skin. The surface is finely lobulated; the color is commonly a vivid crimson but ranges from a bright scarlet to a deep purple and the nævus becomes more prominent and the color more intense when the child strains or cries. In consistency it is soft and boggy. When the deeper layers of the skin and the subcutaneous tissue are involved it appears as a soft, rounded or lobulated elevation showing a faint purple or lilac tinge. When both superficial and deep sites are involved it may be compared to a poached egg, the yolk being represented by the central crimson nodular zone of superficial vascularity which is superimposed upon a more extensive base of the deeper type corresponding to the white of the egg.

Strawberry nævi of infants have a natural history all of their own, entirely different from that of any other type. The essential point of distinction is that they enjoy a period of more or less rapid growth during the first few months after their appearance. This never continues for more than a year and usually ceases between the sixth and eighth months. Thereafter retrogression sets in. Usually all traces of color have been obliterated by the fifth year if not earlier and only in the most prominent nævi is a further term of years required for the final absorption of redundant skin. This is the explanation of the uniformly good results recorded by operators whatever may have been the method of treatment employed.

The physician's attitude toward the treatment of strawberry nævi must be based on the knowledge of their invariable tendency toward spontaneous retrogression. It is easy to be stampeded into advising drastic and injudicious measures. If the nævus is relatively small and in such a location that its destruction will not entail the risk of sepsis or leave a scar which might be unsightly or disabling it is as well to obliterate it forthwith. Radical destruction of a nævus is unjustifiable if the lesion is so placed that the resulting inevitable scar is in the least likely to cause disability or disfigurement. Still more are radical destructive measures contra indicated when the nævus is found to be very large for here such methods must at the least produce more or less gross disfigurement and at the worst they may give rise to either fatal sepsis or hemorrhage.

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fourth day they began to enlarge and became more firm and globular. By the second week they began to recede and by one month they were soft and much smaller than they were when transplanted. Gross infection occurred in 7 cases and in all except 1 the infection occurred in those grafts which had been subjected to cutting or crushing. The cut surface of most of the grafts presented a gray homogeneous appearance not unlike that of normal fat. The grafts composed of multiple pieces and those which had been subjected to crushing were much more oily. Minute droplets of fat exuded from the cut surface of these grafts. There was no complete liquefaction of the graft as occasionally is seen clinically.

The microscopic findings were characterized by degenerative changes in all of the grafts. The most violent and extensive reaction was seen in the homografts (Group D). Those grafts composed of multiple pieces and those which had been crushed (Groups B and C) were subjected to a less violent reaction while those grafts which had been carefully transplanted as a single piece without trauma showed the least degenerative change.

The degenerative changes were manifested by a disappearance of the nucleus of the fat cell, a disintegration of the wall of the cell, the formation of cysts and vacuoles, infiltration of polymorphonuclear leucocytes, lymphocytes and histiocytes, phagocytosis and a gradual reduction in the size of the graft which in some instances continued until the graft disappeared entirely.

The fat cells in certain portions of the graft appeared normal except for the absence of their nuclei. This finding was most noticeable in the homografts one week after operation; this change involved most of these grafts. In the other groups it occurred only in portions of the grafts, especially about the periphery.

A definite but futile search was made to find new fat cells which would lend support to the assertion

that regeneration of fat is the rule after transplantation. All of the fat appearing in the grafts as viable tissue was composed of normal adult fat cells. New blood vessels were visible as early as one week in the autografts which had been made without trauma. They could be followed at succeeding examinations and at nine and twelve months the grafts were well vascularized. No new vessels were observed in any of the homografts and rarely in the autografts which had been subjected to trauma. During the first month, only a small percentage of the implant contained normal fat, but in one year about 90 per cent of the graft appeared to be normal.

These experiments do not justify the opinion that multiple small pieces of fat survive better than does a single large piece. They show that single pieces remain viable for at least one year while original grafts of a similar size and composed of several smaller pieces of fat may last as long as six months but the majority disappear by the third month. The transplants which were obtained from the groin averaged 23 per cent of their original size and those which were obtained from the abdominal cavity 31 per cent of their original size.

Among the conclusions were the following statements:

Subcutaneous fat is a suitable tissue for autotransplantation if proper precautions are taken at the time of transplantation. Although peritoneal fat survives better than subcutaneous fat, the accessibility and successful use of the latter give it preference in the average case. A much larger piece of fat must be transplanted than would at first seem necessary since only from one fourth to one half of the graft survives. The fat comprising the graft at one year after operation is a portion of the original transplanted fat. If that portion of the fat which disappears becomes scar tissue, this also ultimately disappears since the site of the transplant is not marked grossly by scar tissue.

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